

BBC MICRO·MASTER·ELECTRON·ATOM
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ACORN USER
MARCH 1987
BEST-SELLING AND BIGGEST BBC/ACORN MAGAZINE
TRIVIA GAME: Questions galore, and add your own
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BBC COMPACT: Linking View, ABC and Basic
REVIEWS: Graphics, games and business
SPECIAL ISSUE
COMPUTER BRAINS
4 features to make your micro think


FIRETRACK
BLACK OUT THE DEVIL ROCK
FIND THE WHITE LIGHT
AND SAVE THE EARTH
ALL IN THE LINE OF DUTY FOR AN EXPERIENCED SPACE PILOT
MESSAGE
Earth has been betrayed!
The Pirate Industrials have wrenched control of the partly colonised worlds in the Asteroid Belt and declared their independence.
Earth fights back with continual attacks on the colonies' vital trading route, and a deadly sport is born – watching and betting on 'The Firetrack!
MISSION
The Firetrack crosses four main worlds – Baseworld, Dustworld, Iceworld and Mallworld – connected by CommSpaces and fueled by nuclear power planets; cunningly concealed by a Devil Rock at the end of each section.
You must destory these plants and plunge the colonies into darkness. Then you must stop them rebuilding by attacking again in the black-out.
Victory will be well rewarded by the Earth Council. Fail and it's certain death.
A routine mission? We're afraid not. Military reports indicate a standing gravity wave of 'White light' somewhere in the Asteroid Belt. It's vital that we find it and harness its astronomical power before the Pirates get their evil hands on it. You are one of the elite security-cleared ex-military personnel chosen for Firetrack pilot selection. With your experience, and your specially modified Hatchfighter, we know you can find the white light and save us from almost certain destruction.
It's dangerous, but you knew that when you accepted the task. Earth is depending on you.
MESSAGE OVER
Electric Dreams
SOFTWARE
AVAILABLE ON:
COMMODORE 64/128 CASSETTE £9.99 COMMODORE 64/128 DISK £14.99 BBC B MASTER SERIES CASSETTE £9.99
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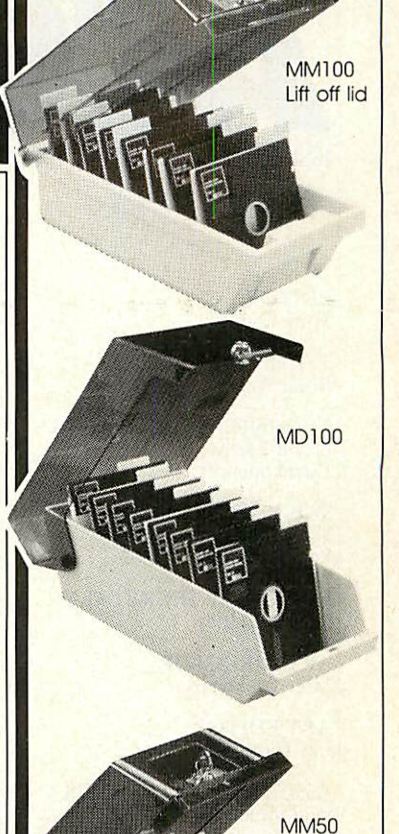
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DS/DD 40	12.80	12.40	12.00
DS/DD 80	17.70	17.00	16.50

3M 3½" Lifetime Guarantee

SS/DD	20.50	20.00	19.00
DS/DD	27.50	27.00	26.00

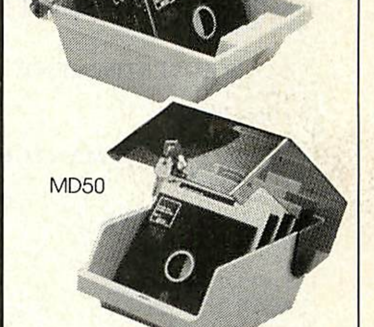
Verbatim Datalife 5¼"

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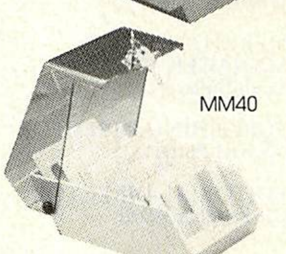


MM100 Lift off lid

MD100



MM50 Lift off lid



MD50

MM40

Disc Boxes

	1	3+
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MD 50 5¼ x50	8.70	7.90
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70 x 36 3 across	4.20	3.80
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102 x 36 2 across	6.70	6.40

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Plain fanfold, micro perf edges

Size	Weight gsm	1000's per box	Price per box 1 box	2 bxs+
11x9½	60	2	12.50	11.80
	80	2	15.50	14.20
EXACT A4 11⅔x9¼	70	2	20.90	18.50
	90	1	13.20	11.00

A4 Fixed tractor paper available

Head Cleaners

Discs with 15ml cleaning solution

5¼" Head Cleaner	4.00
3½" Head Cleaner	5.00

Printer Leads

Centronics lead to connect BBC to Epson Kaga Canon etc.

1 MTR 6.30   2 MTR 8.50

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BLUE RED or BLACK £4.90 each
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ACORNUSER

ISSUE No 56 MARCH 1987

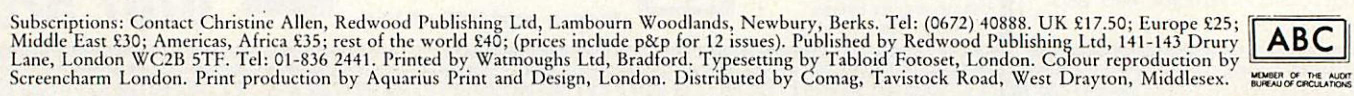
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EDUCATION

REGULARS





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FEATURES

COVER



Illustration by Andrzej Klimowski

NEXT MONTH

Music special issue with guest editor David Acton. Also business software survey

 ISSN 0263 7456.

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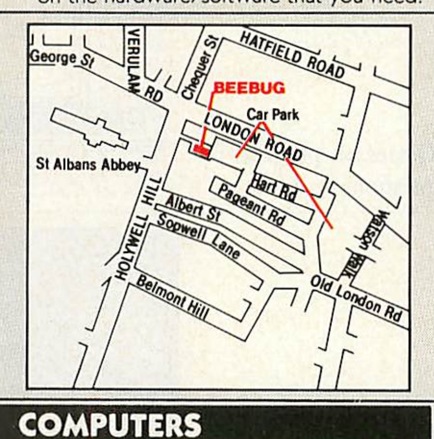
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COMPUTERS

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0197G	Compact+Mono Monitor	544.00	516.80
0198G	Compact TV System	464.00	440.80
0199G	Compact Entry System	444.00	421.80
0200G	Master 128	474.00	450.30
0202G	Master ET	381.32	362.25
0223G	Master Disc Drive Unit	316.00	300.20
0230C	65C102 6502 "Turbo"	119.00	113.05
0231D	80186 Co-Proc	228.85	217.41
0234B	M128 Econet Module	48.87	46.43
0235B	M128 Eprom Cartridge	15.18	14.42
0240C	M128 Manual 1 ADJ22	14.95	14.20
0241C	M128 Manual 2 ADJ23	14.95	14.20
0242C	M128 Adv Ref Manual	19.00	18.05
0203F	'6502' 2nd Processor	225.00	213.75
0204F	'Z80' 2nd Processor	399.00	379.05
0205F	Acorn Prestel Adapt	138.00	131.10
0206F	Acorn Teletext Adapt	115.00	109.25
0217B	1770 Disc Interface	50.24	47.73
0218B	ADFS Upgrade 1770	29.33	27.86
0209B	1.2 DNFS Rom	19.78	18.79
0207B	Basic II Rom	21.85	20.76
0208B	1.2 Operating System	6.90	6.55
0250B	Compact 5.25" Disc Drive Lead	12.32	11.70
0298B	Compact Printer Lead	9.78	9.29

DISC DRIVES

Code	Description	Price	Mem Price
0600F	Cumana CSX100 40T	106.95	101.60
0610F	Cumana CS100 40T	126.50	120.18
0601G	Cumana CDX200 40T	215.00	204.25
0602F	Cumana CSX400 40/80T	142.60	135.47
0603F	Cumana CS400 40/80T	162.15	154.04
0604G	Cumana CD800S 40/80T	286.35	272.03
0614F	Cumana CS100E	118.45	112.53
0615F	Cumana CS400E	155.00	147.25
0611B	Cumana Disk Guide	1.90	1.80
0650B	Memorex DiscsSSDD 40	15.50	14.73
0651B	Memorex DiscsDSDD 80	25.50	24.22
0669B	Memorex 10 x 35" Discs	25.00	23.75
0653B	Disc Case 10 discs	2.25	2.14
0654C	Disc Box - up to 50	10.00	9.50

MONITORS

Code	Description	Price	Mem Price
0501G	Kaga KX1202 Green	116.00	110.20
0502G	Kaga KX1203 Amber	116.00	110.20
0556B	Taxan 1202/2/3 BNC	3.90	3.70
0571D	Stand for KX Series	29.00	27.55
0503G	Zenith 123 12" Green	83.00	78.85
0504G	Zenith 122 12" Amber	87.00	82.65
0530G	Microvitec 1431 Mon.	239.00	227.05
0531G	Microvitec 1451 Mon.	289.00	274.55
0550B	1.0m Mon. Lead RGB	5.75	5.46
0535G	Supervision III RGB	379.50	360.52
0536G	Supervision II RGB	318.55	302.62
0555B	Supervision Mon. Lead	7.00	6.65
0570D	Stand for Supervision	29.00	27.55
0552E	Single Plinth	12.65	12.02
0553F	Double Plinth	23.00	21.85

PRINTERS

Code	Description	Price	Mem Price
0299G	Panasonic KX-P1080	170.20	161.69
0311G	Kaga KP 815	299.00	284.05
0316G	Taxan KP 915 17"	410.37	389.85
0319G	Epson FX85 NLQ	368.00	349.60
0320D	FX85 Tractor Feed	32.20	30.59
0321D	FX85 Sheet Feeder	130.00	123.50
0300G	Brother HR15XL Para	350.75	333.21
0310G	Juki 6100 Daisywheel	362.25	344.14
0309F	Ibico LTR1 NLQ	105.16	99.90
0303G	Canon PJ1080A Col.	520.00	494.00
0308G	Epson JX 80 Colour	520.00	494.00
0318G	Epson HI 80 Plotter	368.00	349.60
0400B	Platten Cleaner Kit	6.44	6.12
0401B	2M Printer Lead	8.00	7.60
0402B	Epson FX/RX80 Ribbon	4.00	3.80
0403B	Epson FX/RX100 Ribbon	5.00	4.75
0408B	Canon/Texan Ribbon	5.63	5.35
0409B	Black Cart PJ1080A	7.19	6.83
0410B	Colour Cart PJ1080A	9.99	9.49
0413B	LX 80 Ribbon	4.60	4.37

BEEBUG

Code	Description	Price	Mem Price
0414B	Ibico Ink Roller	4.60	4.37
0415B	Epson JX80 Ribbon	16.22	15.40
0417B	Shinwa CP80 Ribbon	3.54	3.36
0418B	Juki 6100 S/S Ribbon	1.55	1.47
0423B	Panasonic KX-P1080 Ribbon	5.75	5.46
0406D	11" *9.5" Paper 2000	14.03	13.33
0453G	2-part NCR Paper	23.00	21.85
0407C	3.5" *17/16" Labels	5.63	5.35
0416B	Dust Cover KP810	5.45	5.18

WATFORD HARDWARE

Code	Description	Price	Mem Price
0213B	Watford DFS Rom+Man	27.48	26.11
0214B	Watford DDFS Kit	56.35	53.53
0216B	Watford DFS Manual	6.95	6.60
0219B	Watford 1.43 DFS Kit	62.10	59.00
0702B	Watford 32K RAM Card	67.28	63.91
0709D	Watford Eprom Eraser	33.35	31.68
0717B	Watford Sideways ZIF	17.83	16.93
0736B	Watford 12 Rom Board	36.80	34.96
0737B	Watford Battery	4.37	4.15
0751B	Watford 16K Module	32.20	30.59
0752B	Watford Diagnostic	23.00	21.85
0753B	Rom/Ram Board 64K	67.85	64.46
0754B	Rom/Ram Board 128K	102.35	97.23
1120B	Watford TD Rom (SD)	28.75	27.31

COMPUTER CONCEPTS

Code	Description	Price	Mem Price
1100C	Wordwise Plus	46.00	43.70
1101B	WW + Progbook & Disc	20.00	19.00
1102B	Wordwise	28.75	27.31
1103B	C.C. Graphics ROM	24.73	23.49
1104B	Printmaster (Epson)	28.00	26.60
1105B	Printmaster (Star)	28.00	26.60
1107B	Speech ROM	28.00	26.60
1110B	Intersheet	44.85	42.61
1111B	Hi Intersheet Disc	5.75	5.46
1112B	Hi Wordwise + Disc	5.75	5.46
1113B	Caretaker Rom	28.75	27.31
1114B	Interchart	29.90	28.41
1115B	Speech System TTS	30.99	29.44
1117B	Interword	50.03	47.52

OTHER HARDWARE

Code	Description	Price	Mem Price
0701B	Aries B32 RAM Card	93.15	88.49

Code	Description	Price	Mem Price
0704B	ATPL ROM Board BBC	39.67	37.69
0735B	ATPL Battery Backup	17.37	16.50
0740B	Aries B12 Rom Board	46.00	43.70
0749B	Aries B12C Adaptor	5.87	5.57
0705B	2764 8K Eprom	2.64	2.51
0706B	27128 16K Eprom	3.33	3.17
0707B	6264 8K Ram	3.68	3.50
0708B	Eprom Extractor Tool	3.45	3.28
0710B	Spotlife Rom Blower	75.90	72.11
0714B	BBkey Labels	2.09	1.99
0715B	Dust Cover BBC B/B+	3.45	3.28
0734B	Dust Cover Master	4.60	4.37
0718B	Voltmace 3B Single	9.99	9.49
0719B	Voltmace 3B Twin	17.00	16.15
0720B	Voltmace Delta 14B	12.50	11.88
0721B	Voltmace Delta 14B/1	13.00	12.35
0762E	Beebug Magic Modem	90.00	85.50
0763E	Beebug Modem + S'ware	104.00	98.80
0810D	BBC Keyboard	52.90	50.26
0811B	Video ULA Chip	17.25	16.39
0812B	A to D D7002C Chip	5.29	5.03
0814B	Keyboard Connector	5.75	5.46
0815B	65C02 CPU	13.80	13.11
0764F	Red Box Starter System	129.00	122.55
0765D	Red Leader	59.95	56.95
0766D	Red One	34.95	33.20
0767D	Red Two	34.95	33.20
0809D	Master Keyboard	52.90	50.26

ACORNSOFT

Code	Description	Price	Mem Price
1022C	View 3.0 Rom	66.70	63.36
1002B	Acornsoft Hi-View	44.28	42.06
1014B	View Print/Drive Disc	9.77	9.29
1043B	Acorn Viewspell Rom	34.02	32.32
1021B	Acorn Viewindex Disc	13.80	13.11
1019B	Acorns Viewstore Rom	44.28	42.06
1030B	Acornsoft ViewPlot	25.30	24.03
1001B	Acornsoft View Sheet	44.28	42.06
0243B	Master Lisp C.ROM	59.69	56.70
1041B	Acornsoft Forth Rom	45.00	42.75
1027C	Micro PROLOG	74.75	71.01
1033B	Microtext Disc	55.20	52.44
1034C	Microtext Plus Rom	240.00	228.00
1035B	6502 Dev. Pack	45.00	42.75
1004B	Acornsoft BCPL	53.00	50.35
1026B	BCPL Generator	43.57	41.39
1005B	Acornsoft Comal	48.00	45.60
1006B	Acornsoft Logo	62.00	58.90

Code	Description	Price	Mem Price
1007C	Acornsoft ISO Pascal	62.00	58.90
1028B	Pascal Generator	32.78	31.14
1008B	Acornsoft Basic Ed	28.00	26.60
1040C	Micros Business Disc	47.27	44.90
1017B	Acornsoft GXR B	28.00	26.60
1018B	Acornsoft BXR B+	28.00	26.60
1039B	Creative Sound Disc	19.00	18.05
1015B	Acornsoft Revs Disc	17.08	16.22
1029B	Revs 4 Tracks Disc	11.95	11.35
1016B	Acorn Aviator Disc	17.08	16.22
1036B	Elite Disc All'vers	14.95	14.20

AMX MOUSE

Code	Description	Price	Mem Price
0703B	AMX Mouse	72.63	69.00
1150B	AMX Desk Disc	19.00	18.05
1151B	AMX 3D Zicon Disc	19.00	18.05
1152B	AMX Database Disc	19.00	18.05
1153B	AMX XAM	19.00	18.05
1154C	AMX Pagemaker Plus	40.00	38.00
1155B	AMX Superart Rom	40.00	38.00
1156B	AMX Paint Pot Disc	10.99	10.44
1160B	AMX Utilities	10.99	10.44
1161B	AMX Max	19.00	18.05
1162B	AMX Pagemaker Plus Master	40.00	38.00
0757B	AMX Mouse (MASTER)	72.63	69.00

OTHER SOFTWARE

Code	Description	Price	Mem Price
1123B	SPEECH! Disc 40/80T	11.95	11.35
1124B	Citadel 40/80	11.95	11.35
1125B	White Knight Disc	18.63	17.70
1127B	White Knight 1770	18.63	17.70
1128B	Movie Maker	20.95	19.91
1129B	THRUST	11.95	11.35
1130B	REPTON2	11.95	11.35
1170D	Fleet Street 40T	37.95	36.05
1171D	Fleet Street 80T	37.95	36.05
1135B	Instant Mini Office	59.95	56.95
1173B	Mini Office II 40T	16.50	15.68
1174B	Mini Office II 80T	16.50	15.68
1175B	Clares Replica III	15.00	14.25
1011B	BBCsoft UltraCalc 2	70.00	66.50

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Code	Description	Price	Mem Price
1418A	£1 Gift Voucher	1.00	1.00
1419A	£5 Gift Voucher	5.00	5.00
1420A	£10 Gif Voucher	10.00	10.00

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News

Next month in AU

Tune into next month's *Acorn User* for a special issue on the theme of The Singing Computer. David Acton hosts the section which will feature four main articles.

Autumn is the first. This utility allows you to save files from music software to be played on a standard BBC micro. Next is *The Music Editor*, which enables you to write and display three parts on the screen at a time! Finally, for Music 500 and 5000 buffs, there's an article on writing with the system's Ample language – and an original piece to type in and play.

And for readers who aren't in the musical vein, there's a utility for printing out enormous spreadsheets sideways on a dot matrix printer; sideways RAM is covered in First Byte; and Hints and Tips tackles the safe ways of 'peeking' and 'poking' to the screen.

Adventures can see what our reviewer thinks of the two multi-user games around, British Telecom's *MUD* and Micronet's *Shades*. Plus there's news, business, education and reviews of hardware and software to get through, as well as the other regulars.

Checksums

If you have problems getting listings to run, send in for our checksum utility and the line-by-line calculations which can help you find errors. Blunderboxes from January 1986 are also included.

Simply send a large, stamped, addressed envelope (about the size of this magazine) to *Acorn User*, March Checksums, PO Box 641, London NW9 8TF. Back issue checksums are available from December 1986. Please state clearly which you require on your envelope.

GP uses micro in AIDS battle

A London doctor has brought information technology into the fight against AIDS. The latest information is available to the public 24 hours a day on his Healthdata bulletin board run on a BBC micro.

Up to 80 callers a day log on to Dr Christopher Dobbing's Prestel-like database, with AIDS the most sought after topic followed by sexually-transmitted diseases, contraception, smoking and alcohol.

Wide response

'An increasing number of schools and colleges are calling in, as well as the enlarging band of micro enthusiasts. But interestingly enough, it's now their brothers, sisters and friends – and in the evening after they've gone to bed, their mums,' explained Dr Dobbing.



Printed advice: outdated?

Privacy he believes is a major plus point: 'People can look through at their own speed in their own home. They don't even have to ask for a leaflet.'

Other advantages over written sources are up-to-the-minute service and ease of use: 'Even the recent leaflet delivered to homes has some questionable information, but this system is quick to update.'

Dr Dobbing is a keen advocate of information technology, but his efforts have been ignored by most doctors and the Department of Health. He believes lack of equipment and fear of high telephone charges have hampered doctors, while the DHSS wants large, centralised computer systems.

Instead it's the public and schools who have caught on. Some schools have downloaded pages to help with project work and Dr Dobbing has encouraged them to set up their own databases, and send in results.

And it's not just the academic children who are keen. 'Looking at a screen appeals to people who might never pick up a book,' he said.

Possibilities

Dr Dobbing has given lectures to doctors about viewdata and there has been interest in off-line information to be displayed in waiting rooms. He aims eventually to assess the possibilities of night mail with the SJ Research Interspan system recently announced, and hopes to swap information with other boards around the country so more people have cheap local phone rates.

Healthdata can be accessed with a Prestel-compatible modem on 01-986 4360.

BBC routines ease Ceefax

The BBC's Ceefax service, which broadcasts computerised information alongside the standard television pictures, has announced a series of programs to help people get the best from the service, which is free once a teletext adapter has been purchased from Acorn or Morley.

Ceefax has recently been boosted in popularity by the release of the BBC's £7.95 *Advanced Teletext* ROM.

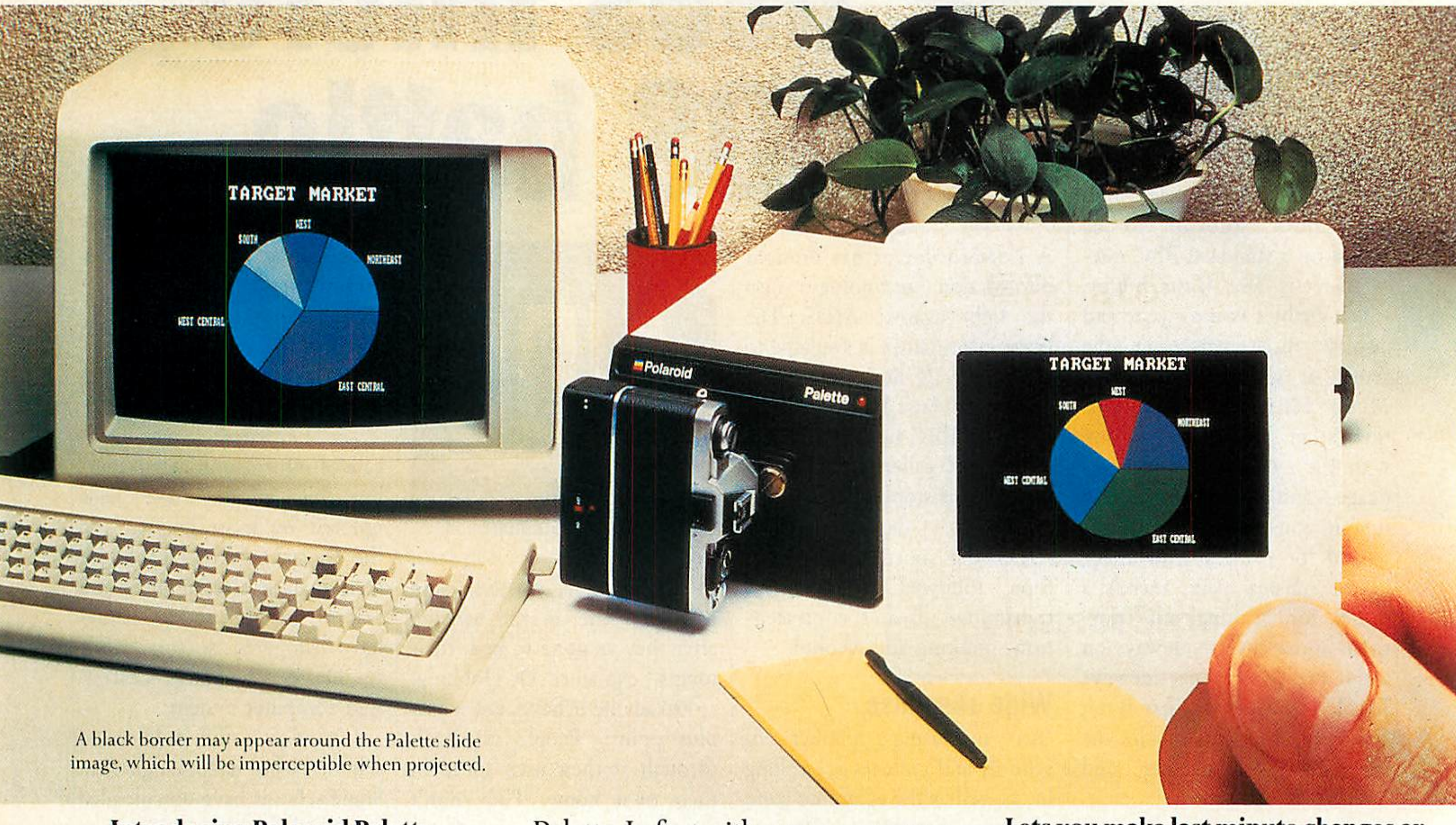
● BBC Soft has released a set of three discs full of samples of educational software. These can be freely distributed by local authority advisers, or are available to teachers from the BBC for £5 to cover disc costs.


Communicator: built-in modem

Acorn order

Acorn has announced large orders for its 16-bit Communicator. Thorn EMI wants 500, while a Pickfords order could run to 1400. The machine has a built-in modem, and is an intelligent terminal for data transfer, Econet and viewdata. It uses the 16-bit version of the 6502 chip found in BBC micros.

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Whether your presentation is in 30 minutes or 30 days, the new Polaroid Palette Computer Image Recorder will make it easier. It lets you make Polaroid Instant 35mm slides or prints from personal computer-generated data. Right at your desk. So now you can create a presentation in minutes. Without sending out for processing, paying premiums for rush service or risking the security of your confidential information.

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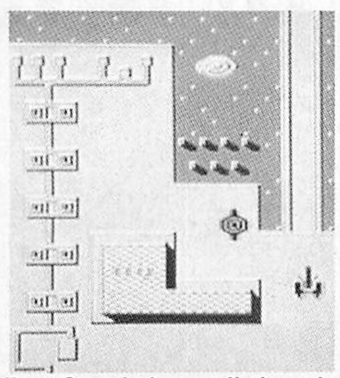
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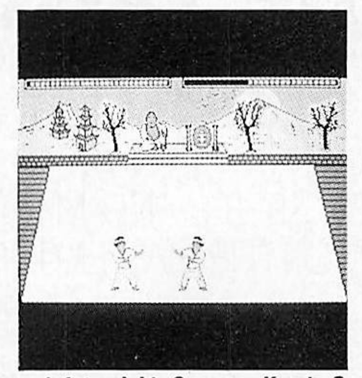
Polaroid

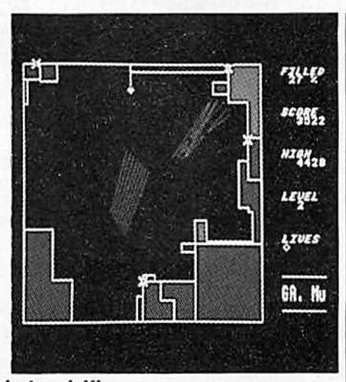
AU.3.87

News in Brief

- Ceefax viewers astounded the BBC with 40 recipes for seasonal fare at Christmas. The recipes were pulled together in a booklet and sold for donations to the Children in Need Appeal. Some 1200 requests netted £1400.
- Acorn has announced a boardroom reshuffle, with the appointment of a new chairman and two new directors. Bruno Soggiu is to be chairman with Paolo Tosi and Franco Agostinucci appointed non-executive directors. All are from Olivetti, replacing Alex Uboldi and Jim Edwards who have resigned.
- Electron users now have their own section on Micronet. The Electron Bit, part of Beelines, is on page 8009315.
- Unemployed women in Greenwich, London can now take advantage of a special course from Thames Polytechnic's Continuing Education Unit. The 10 week course, Women into Business and Computing, is supported by the European Social Fund and covers management, marketing, office automation and programming.
- Computers can be protected from mains surges and spikes up to 10,000v with the Apollo four-way mains outlet socket. It costs £15.99 inclusive from Bowthorpe EMP, Stevenson Road, Brighton BN2 2DF.
- Two primary programs aim to develop cognition skills. Selective Software's *Cuthbert Catches A Cold* is an adventure including animated graphics, and Longman's *Picpop* helps with maths and geometry. Selective Software, 64 Brooks Road, Street, Somerset BA16 0PP, and Longman Software, Longman House, Burnt Mill, Harlow, Essex CM20 2JE.
- British Embassies in Prague and Ankara now have educational resource centres equipped with BBC micros, and of course back copies of *AU*.







From Superior's compilation releases, left to right: *Syncron, Karate Combat* and *Kix*

Electron Plus 1 and Plus 3 games packs

Pressure from readers had led Superior Software to include a disc for Electron Plus 3 owners in its March launches of three games compilations.

Almost 500 letters and phone calls persuaded Steve Botterill that it was worth doing Electron software in the 3.5in disc format. He added that the level of sales had also justified putting out the compilations in Master Compact format.

All three carry eight titles, including a new game.

Compilation 1 for BBC micro and Master will be: *Syncron, Karate Combat, Repton, Airlift, Wallaby, Star Striker, BMX on the Moon* plus *Smash and Grab*.

Number 2 holds *Kix, Death Star, Missile Strike, Crazy Painter, Repton 2, Space Pilot, Battle Tank* and *Overdrive*.

Compilation 3 will come on the Electron 3.5in Plus 3 format: *Syncron, Repton, Repton 2, Karate Combat, Mr Wiz, Smash and Grab, Death Star* and *Overdrive*.

Syncron and *Kix* are both new, and prices will be £9.95 for cassette, £11.95 for 5.25in disc, and £14.95 for 3.5in disc.

ROM power

Micro Power is to release nine of its games on three ROM cartridges for the Electron's Plus 1 and Slogger ROM Box add-ons.

Each cartridge will cost £19.95. The first will carry *Stock Car, Cybertron Mission* and *Bumble Bee*. Number two will be *Killer Gorilla, Mine* and *Positron*. The third has *Felix in the Factory, Electron Invaders* and *Chess*.

- Games news – see page 135.

Amcom E-Net kit price cut

Network supplier Amcom has cut the price of its Winchester systems. The 20Mb hard disc, compatible with Acorn ADFS, now costs £650. The E-Net version with fileserver software is £1200 (both plus VAT).

Amcom also has a tape-streamer for making copies of the hard disc fileserver. This costs £1200 (plus VAT) and is claimed to copy 10Mb of data in five minutes.

Amcom is at 35 Carters Lane, Kiln Farm, Milton Keynes MK11 3HL.

Help for the handicapped

Hospitals and schools working with physically and mentally handicapped people now have a specialist consultancy to turn to. Brilliant Computing has been set up solve problems and market the solutions.

Founders Nick Pronger and Roddy Boyes have several years' experience working with teachers and therapists using BBC micros.

For special software, simple interfaces or switches, contact Brilliant Computing at PO Box 142, Bradford BD3 0JN.

School software getting warmer

Clwyd Technics, publisher of *Edword*, has released *Measure and Tell*, a temperature activity pack for schools.

Two types of thermometer with software are backed up by graph and data plotting programs, experiments on disc, guides and a wall chart. Further support for primary children (in the pack) includes a story book, audio tape, certificates and badges.

It costs £59.45 plus VAT, with £10 off if ordered before April 30. Clwyd Technics, Antelope Industrial Estate, Rhydmwyn, Mold, Clwyd.



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The non-slip ball and optical encoder system is precision engineered for the kind of accuracy and reliability you would expect, and the mouse is supplied with a generous (1.5m) length of cable which trails behind the mouse so it won't get in your way.

Digimouse is compatible with all the AMX and Wigmore graphic art/word processing packages, and is supplied with a choice of two graphic art programs – our own 'GRAFIK' CAD package, or the excellent 'ARTROOM' from Clares.

And for the COMPACT only you can purchase Digimouse on its own, without software, for only______ **£37.90**



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The Comms Column

Communicating the latest

● Prestel now has a publicly accessible 1200/1200 full duplex port on 01-680 9833. It is especially useful for sending previously prepared mailboxes, though you will of course need a modem with this baud rate. British Telecom Gold already offers a 1200/1200 full duplex line on 01-583 1200.

● Prestel has also set up several high speed data lines for modem and software manufacturers to use for test purposes. Public access I gather is to be opened, allowing callers to connect to the services at baud rates ranging from 300/300 to 2400/2400 full duplex.

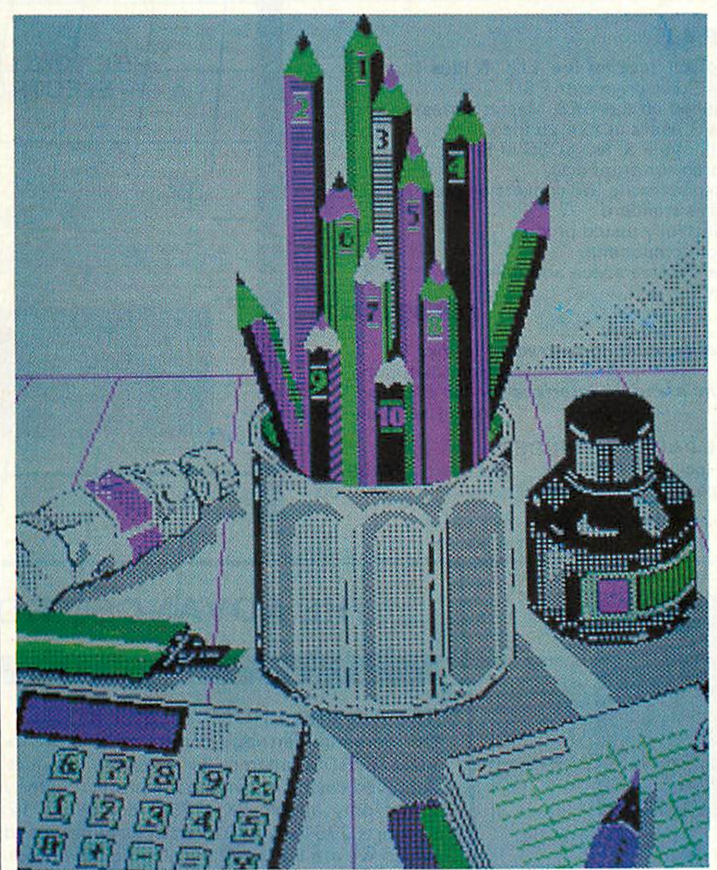
● BBC Soft has changed the name of its viewdata service from 'Owltel' to 'BBC Tel' and due to its move of offices, the number is now 01-576 0541 (1200/75 baud). The BBC Soft office can be contacted on 01-576 0548 for more details.

● Pace has reduced the prices of its high-speed series IV modems. The 1200/1200 (V22) full duplex model has been dropped from £479 to £399, and the top of the range 2400 baud (V22bis) model now costs £499, reduced from £619. All prices plus VAT. Pace can be contacted on 0274 488211.

● Compunet, the Commodore electronic mail system, has postponed its opening to the BBC micro world. More powerful equipment will be installed later in the year, to accommodate an expected intake of more users.

● I'd like to hear from readers wanting to share each others' communications-related news, views and hints. Applicable press releases would be greatly appreciated. Write to Buzz at *Acorn User*, 141-143 Drury Lane, London WC2B 5TF.

Buzz



Inglis Images. Above: a cover for *Designer* magazine. Below: emulations of Seurat and Matisse





Inglis's art hits disc

Computer artist Jonathan Inglis, who did the covers for *Acorn User* in January and November 1986 and January 1987, has released a disc of his 'greatest hits'.

In most of his work Jonathan regards the graphics limitations of the BBC micro as plus factors, giving pictures a style unobtainable in any other medium. He uses *Acorn User* art software, *AMX Art* and utilities of his own.

Jonathan's work has been seen in several magazines and in advertising campaigns for *Today* newspaper, Channel 4, British Telecom and Asda.

The main picture here was used on the front cover of *Designer* magazine, while the other two show how the BBC micro can attempt to imitate the style of Seurat and Matisse.

The 40-track disc has nine pictures for loading onto a standard BBC micro or Master, or an art package, and an 80-track version has 12. Each costs £6.95 inclusive from Jonathan Inglis, 35 Whatman Road, London SE23 1EY.

Another module for Red Boxes

Red Boxes, the programmable mains control system, now has an alarm to complement its role in home security.

The system, reviewed in December's *AU*, can be programmed to control electrical equipment through the mains. The alarm, Red Five, links to the standard pack of the intelligent Red Leader, Red Two heat sensor and Red One control plug.

Once Red Leader has been programmed from a BBC micro, it can control via Red One the actions of any mains appliance anywhere in the house. With extra Red Ones added, hundreds more appliances can be controlled.

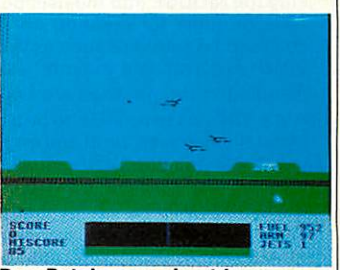
Other boxes due include window and door contact switches and pressure mats.

The system including the alarm costs £167.95. The alarm alone is £34.95. There is also a project manual at £9.95. Electronic Fulfilment Services, Chesterton Mill, French's Rd, Cambridge CB4 3PN.

Sky Hawking

Skyhawk is the latest shoot 'em up game from Bug-Byte.

It was a chart success for the Commodore 16, and Bug-Byte claims that there is the same feel and playability on the Electron/BBC micro conversion, which costs £2.99, available on cassette only.



Bug-Byte's new shoot 'em up arcade game, *Skyhawk*

NEW PRODUCTS
ADVANCED PRINT BUFFER is a program that runs in sideways RAM and provides a large printer buffer, instead of the resident 63 bytes. Large means over 14K (14 700 characters) allowing letters, reports, documents, listings etc. to be printed while you carry on with another task. Full control is provided to switch buffer on/off, purge buffer, even changing the effect <ESCAPE> has on the buffer (essential when using w/procs such as View) **(5¼ A/DFS) /B/M/C £5.95**
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Two shows Acorn users shouldn't miss

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20-22 MARCH

10am-6pm, Friday March 20
10am-6pm, Saturday March 21
10am-4pm, Sunday March 22

ELECTRON & BBC MICRO USER SHOW

New Royal
Horticultural Hall
Westminster
London SW1

8-10 MAY

10am-6pm, Friday May 8
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10am-4pm, Sunday May 10

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UMIST, Manchester
March 20-23

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Post to: *Show Tickets, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.*

Name..
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....
Signed..

PHONE ORDERS: Ring Show Hotline: 061-480 0171
Please quote credit card number and full address. Ref AU3

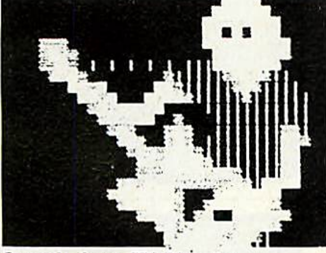
News in brief

Sciways supports over 350 characters and symbols on both Epson printers and the screen display. For BBC models B and B+ and Master, it costs £38.52 inclusive from Mayhew Telonics, 376A Ringwood Road, Poole, Dorset BH12 3LT.

Micro Express is to drop all cassette-based software, so existing stock is being cleared at half price. Phone (0533) 375757 for details.

Cambridge Microprocessor Systems has introduced a 16-bit 68000 processor card crammed with 2Mb of RAM and 1Mb of ROM, surface mounted. It connects to the BBC micro via the serial port, but other interfaces are available. Contact CMS, Brookfield Business centre, Twentypence Road, Cottenham, Cambridge CB4 4PS.

For £14.95, Squirrel Software has a program to practise many of the skills of directing TV shows. *TV Director* can even produce a video for viewing away from the micro. Squirrel, 4 Bindloss Avenue, Eccles, Manchester M30 0DV.



Sample from *TV Director*

Software downloading with the Morley Teletext Adaptor can be improved with Morley's version of the BBC *Advanced Teletext System* ROM. It costs £3.75 from Morley Electronics, Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne and Wear NE28 6BY.

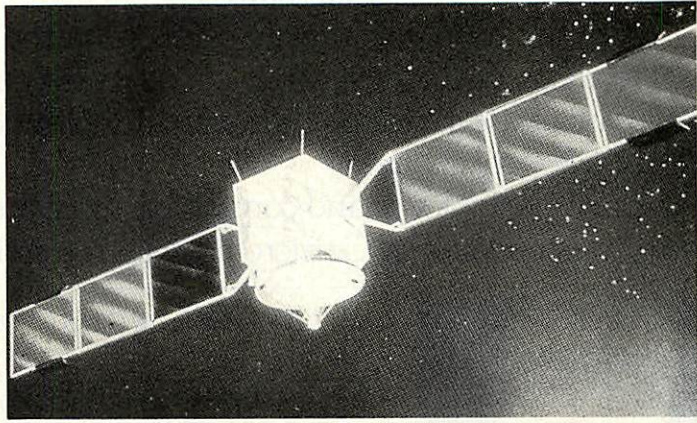
A link with 150 Information Technology Centres (ITEC's) boosted Micronet's Children in Need appeal to £45,000. ITEC's held events with local computer clubs. Micronet members bid on-line to add to funds.

Message in a bottle gives way to micros

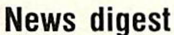
By Paul Horrell

Tycoons sunning themselves on yachts in the Mediterranean, oil workers on North Sea rigs and seamen off the Falklands can now get regular and up-to-the-minute news via on-board BBC Masters and modems.

Some 5000 ships, including 300 private yachts, around the world have Satcom, an on-board telephone and telex receiver beaming to three satellites run by the United Nations agency Inmarsat. Oceansat takes advantage of the telephone facility to send videotext to micros on the ships.



Intelsat's MARECS 2, transmitting Oceansat news



News digest

Twice a day, Oceansat broadcasts a bulletin of news, sport and financial market information (for those tycoons). Some 80 mode 7 screens are transmitted at 2400 baud in five minutes. Each ship carries the BBC Master and modem repacked in an Oak Universal casing, two disc drives, a monitor and a printer. The bulletin is downloaded onto disc to be called up at leisure.

Software designed by MIMAC of Liverpool and supplied by Oceansat gives several options for the bulletins. The text can be printed, formatted in three columns to provide a newspaper for copying and distribution among the ship's company. Or a scrolling video display can be generated.

On cruise ships – six already have the installation – monitors around the vessel can be seen by passengers, and the software allows individual messages to be added, as well as advertisements. The second disc drive holds mode 1 or 2 graphics screens, prepared in advance to be interspersed with the scrolling news. *Acorn User* contributor Phil Wilkes has designed some of these.

Ready market

As well as six cruise ships, Oceansat boss Ken Benson can boast of supplying the Royal Fleet Auxiliary oil tanker Green River, currently in the South Atlantic. As SATCOM covers the globe, remote land installations could also make use of the service.

So does it cost much to keep in touch? For passenger ships, renting the software and hardware is US$900 per month, but the ship keeps some advertising revenue, so could finish in profit. Non-passenger ships pay $450 per month and buy the hardware for around £1900.

But if you fancy bolting a Master to your tub in the Solent, remember that the necessary Satcom terminal costs some £18,000.

Oceansat are at Avmar House, 61 Brushfield Street, London E1 6AA.

Ready set up comms packs

PMS Communications has announced a range of four software packs under the *Dialup* label, each configured for a particular type of user.

The four are *Dialup* Personal, Educational, Commercial and Professional. The first two cost £89.95 and £91.94.

The discs can be freely copied but each pack comes with a special type of cable to the modem from the BBC micro or Master, without which the software cannot be used.

The Personal pack is configured for Micronet and similar, while the Educational version is set up for The Times Network for Schools and Prestel Education. A schools tutorial disc is included in the pack.

For £259.95, the Personal version can be had complete with an up-market Miracle WS4000 modem.

Commercial and Professional versions will be released later in the year, the first with facilities such as encryption, and the second designed for those who want to run their own bulletin boards, or viewdata systems. Details at Norfolk House, Smallbrook Queensway, Birmingham B5 4LJ.

With the AMX range of Software, you can now forget about the Mac, the St., the Amiga, Windows and Gem.



It's no surprise that nearly all new 16 bit 'state of the art' micros now come with a Mouse and Wimp environment (Windows, Icons, Menus and Pointers) as standard.

With the BBC you already own one of the classic micros and by simply adding the AMX range of software you can achieve the same ease of use, freedom and versatility of much more sophisticated computers.

The AMX Mouse and compatible software – it's what you and your BBC micro have been missing.



ART AND MOUSE OPERATING SYSTEM

AMX MOUSE PACKAGE 16K Rom and Disc — **£79.95**

There's not much joy in a joystick and keyboards can be all fingers and thumbs. Acclaimed by the press as 'the best input device', already over 30,000 BBC users have adopted an AMX Mouse. Available for the BBC, B+, Master 128 and Master Compact. Please state version when ordering.

AMX SUPERART AND MOS (only) — **£49.95.**

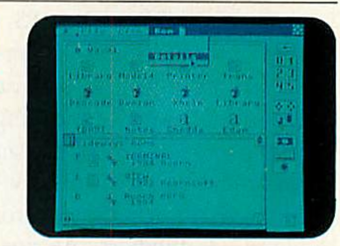




GRAPHIC DFS FRONT END

MAX 16K Rom — **£19.95**

MAX provides an easy to use graphic based front end to your computer's disc filing system including a comprehensive set of disc management operations such as cataloging, copying, deleting and re-naming, you can also run programs from within MAX. Available for the BBC, B+, Master 128 and Master Compact. Please state version when ordering.





DESKTOP PUBLISHING

AMX PAGEMAKER 2 x 16K Rom, 2 x Disc — **£49.95**

Produce professional documents and newspapers with text and graphics, supplied with 16 variable typefaces it has many graphic functions including cut, copy, paste, etc. Available for BBC, B+, Master 128 and Master Compact.

EXTRA! EXTRA! 2 x FLIPPY DISC — **£24.95**

300k fantastic clip art, over 25 fonts, and utility software.



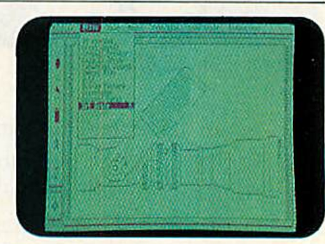


COMPUTER AIDED DESIGN

AMX DESIGN 32K Rom and Disc — **£69.95**

A highly sophisticated CAD package allowing drawings such as a PCB design up to the most intricate architectural drawing.

Advanced features include full zoom and macro facilities, 58 x 58 screen canvas, fully supported printer and plotter output. (Launch date Feb. 1987). Available for the BBC, B+, Master 128 and Master Compact.



There is also a growing list of additional AMX software requiring the original AMX Art Rom or Super Art Rom including:
AMX 3D Zicon **£24.95**, AMX Database **£24.95**, AMX XAM **£24.95** AMX Mind Games **£14.95**, *AMX Utilities **£14.95**, *AMX paint Pot **£14.95**.
*These programs are only suitable for use with the original AMX Art/Rom which can be purchased with a mouse for **£69.95**
A Mouse (only) can be purchased for **£34.95** direct from AMS, using the order form enclosed in each of the four major software packages (see screen shots).
These superb products are available from all good computer dealers or direct by cheque, access or visa. All prices include VAT and post and packaging.



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TUBELINK ON PRESTEL PAGE 2582182 SUPPORTS THE AMX MOUSE AND ALL AMS SOFTWARE.

Lab simulations on Domesday format

A chance to try out a £15,000 gas chromatograph without the attendant risk of blowing yourself up is provided by a video disc which runs on the BBC Domesday player.

The *Interactive Science Laboratory* conducts a series of experiments in chromatography, distillation, electricity and electrolysis. Video pictures of the experiments are overlaid with text and captions controlled in response to user input.

A BBC micro with the Phillips Laservision 83 or the Master-based Domesday system can run the discs, which are a result of co-operation with the Department of Trade and publishers John Wiley. No extra equipment is needed.

Futuremedia, the discs' producers, hope some will be sold to homes as well education. However at £350, this might take time. Futuremedia is at 44a Aldwick Rd, Bognor Regis, West Sussex P021 2PN.

For more expert workers, Procyon has *Lab Assistant* for the BBC B and Master. It claims to help physical scientists with everything from analysis to report presentation. It costs £150 from Procyon at 16 Union Road, Cambridge CB2 1HE.


Acorn Cambridge Workstation

Intelligent Interfaces provides hardware for engineers and scientists who need more than a Master. The company is a distributor for the Acorn Cambridge Workstation.

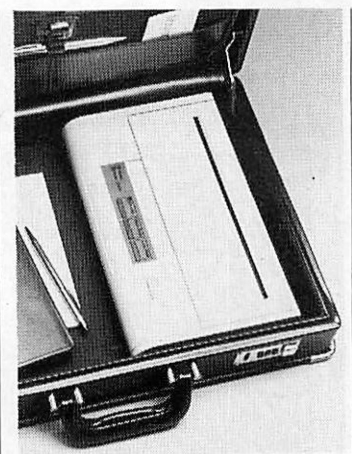
This offers 32-bit processing at 10MHz with 4Mb of memory. Fortran 77, C, Lisp and Pascal are included for £3480. The standard BBC interaces and IEEE are available. Details from Intelligent Interfaces at 43b Wood St, Stratford-upon-Avon, Warwicks CV37 6JQ.

Use 5.25in discs on your Compact

Master Compacts can use 5.25in disc drives. An Acorn application note tells how.

The 1772 disc controller chip used in the Compact, and later Masters, will not work with many older drives which work too slowly (see Martin Phillips' letter, page 21). A special cable (Acorn has a diagram) should link the two drive types. Newer Compact Welcome discs contain a sideways RAM image of the old 1770 DFS. With this and a suitable drive, Master files can be used.

The 5.25 Application Note and new Welcome disc costs £5 from Acorn's Service and Training department.


Diconix 150 A4 printer

Printer in a briefcase

For £399 (plus VAT) you can now carry a printer around in your briefcase.

The Diconix 150 weighs less than four pounds, and has a claimed speed of 150 cps in draft mode. It can also produce near letter quality print. The 150 acts as an Epson FX printer and has a Centronics parallel port. Batteries are rechargable, while the ink jet cartridges have a life of up to 500 sheets.

● Star has two more dot matrix printers, both aimed at business. The NB24-15 has 25 pins giving letter quality and a speed of 216cps.

LETTERS

Write to Letters, Acorn User, 141-143 Drury Lane, London WC2B 5TF

EXPERTS FORGET

Sir, The letter headed Too Much Jargon (*AU* December 1986) and others in similar vein suggest to me that some of your authors are affected by what might be called 'Expert's Amnesia'. A person who has reached the expert stage in almost any branch of knowledge, including computers, forgets rather easily how much time and effort were expended in reaching that stage.

When I look back to my mid-teens I remember well the satisfaction I experienced when I was able, for example, to derive the formula for the conditions of balance of a Wheatstone bridge, with the help of a diagram and half a dozen lines of mathematics. Nowadays the derivation is little more than a mental triviality, and I cannot now recall the exact extent of my knowledge in the subject several decades ago. If I look into a textbook of relevant level it all looks very straightforward, and a real effort is needed to convince myself that the material required a year of study and application.

I believe that many experts have this kind of difficulty, though some ignore it and some disparage it. For most experts who wish to write helpfully for readers less familiar with their field it is necessary to recognise that there is a special skill in appreciating the state of knowledge and the rate at which this can be absorbed. Acceptance of the need for such skill is a useful step towards acquiring it, and another sign of progress comes if the author is able to read exactly what he has written on his paper – not what is in his head, or what he would say in conversation but simply what will be conveyed to his reader by his written words.

There should be no unwritten 'wykwims' (well, you know what I mean).

Charles Wass
Hull

LOGICAL LANGUAGE

Sir, I am alarmed to see the appearance in your magazine of more than one letter criticising what their writers refer to as an excess of 'jargon' in your pages.

Any specialised subject has its own language, and necessarily so. If I pick up a mechanics magazine I don't know what half of the articles are talking about; if *Electronics & Wireless World* prints an article full of formulae then I probably won't understand it, because I'm not a mathematician. However, I am aware that the information is being presented in the most coherent manner for the subject concerned.

In fact, computer jargon is distinguished by its simplicity: unlike, say, medicine, where knowing Latin is almost essential, or the wilfully obscure jargon of law, the language of computing is clear and logical, and can be learned with ease.

If *AU* prints an article that I don't immediately understand, then I consider this to be a challenge, and I attempt to make some sense of it. Were it not for the possibility of finding new information within its pages, I would not be reading your magazine.

Beginners seem very well served, what with the interminable beginners' series run by all the magazines, and countless basic books on the market. How about some consideration being given to the experienced user? I for one would be glad to see articles of greater complexity, with more information compacted into a small space as in, for example, the Advanced User Guide.

James Fryer
London

HELP THE DISABLED

Sir, I have recently been experimenting with *FX3 and have run into some problems. *FX 3,2 disables the printer as well as the screen, as do the other codes which disable the screen. Your advice would be much appreciated, as I am diffident about buying software unless I am sure that the machine is satisfactory.

D Shave
Rugby

This problem arises as the commands to disable the screen actually disable the VDU driver. It is this that interprets any VDU or PRINT command that you give. It is not obvious whether you want to disable the screen or the printer but try the following:

***FX 3,2**	**Disable VDU driver**
VDU 21	**Disable screen**
***FX 3,4**	**Disable printer**
***FX 3,64**	**Disable printer unless character is preceded by a VDU 1**

LOSING THE LINE FEEDS

Sir, Re: 'Calligraphy'. Aargh! Valerie Britton's letter (December) has struck a mortal blow! I was really pleased with all that logic she so cruelly suggests is thrown away. Do those routines really not work for an LX-80? Read on – perhaps help is at hand.

I have received some letters from people who have had difficulty in getting the enhanced Calligraphy program (the one on the monthly cassette) to work with printers which have the internal DIP switches set to provide line feeds with each carriage return. The following changes put things right, at least with my RX-80:

260 VDU 1,13 (already mentioned in December's *AU*)

1310 PROCswitchon: PROC linespace

Line 1310 now sends the print head back to the beginning of the line not with a carriage return but with the ESC "@" initialising code, thus removing the offending line feed. Because the printer is now in its just-switched-on state, the line spacing must be reset for graphics by PROClinespace.

Mike Turner
Essex

for the BBC &...

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MD802C	Dual 800K drive with 40/80 track switch	£269.95
MD802E	Dual 800K drive, double sided, with 40/80 track switches and P.S.U.	£299.95
MD802DM	Dual 800K drive, double sided, with 40/80 track, P.S.U. mounted in plynth.	£324.95
All 5¼" Drives have 40/80 track switch mounted in front plate of disk drive.		

All prices include V.A.T.





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BIGGER BLUNDERS

Sir, I noticed that your ace roving reporter Orson Fact reported that Messrs Quinn and Smith spent the evening of Thursday 16 October trying to squash 24 pages of listings into just 16.

After having read the January issue it is obvious that these two are still having trouble and I suspect their only solution to date is the marvellously low-tech method of throwing the listings into the waste paper bin... hence the missing listings 3 and 4 of Kiddie Art!

Is it my imagination or is the Blunderbox getting bigger and bigger each month?

Trev Douglas
Leicester

The two listings were extras to the article, and were going to be published only on the monthly disc and cassette. However, copies of them are available: simply send a large stamped (24p), self-addressed envelope to *Acorn User* March Information Pack, PO Box 641, London NW9 8TF.

The pack contains all recent Blunderboxes, a copy of the Tessie Revivis Checksum listing and article from the August '85 issue, and the checksum list for March. A new pack is always published for each issue.

For those unfamiliar with checksums, here's how they work. If you type in a program which won't run, you can use the checksum program to count the number of characters in each line. You can then check the results against the printed list to see which lines are giving problems. It isn't foolproof, but can be a valuable help when bug-hunting.

In answer to your final point, yes, the Blunderboxes have been bigger recently. We're printing them bigger so people spot them easier!

HORSES FOR COURSES

Sir, I was interested in Joe Telford's comments on the 'best language' (*Acorn User* December 1986).

I believe there is no one best language because the best language for any application depends on the requirements of that application. Moreover, I suspect that there never will be a single best language. It will always been possible to write an application-specific language which handles that particular application more efficiently than any general purpose language ever could. Basic has been much criticised, and it is certainly not ideal for every application, but then neither is any other language.

Perhaps the most important criticism of Basic is that it is unstructured. But just as there is no single best language, there is no single best way to write programs. If someone is writing programs purely for their own use, there is no reason why they should not adopt whatever style happens to suit them. Indeed, in such circumstances, there are many disadvantages to using long meaningful names and abundant REM statements.

I am a research scientist working in a University and I need to use a computer only occasionally. I invariably use Basic even though it is not the only language available because, while it may not be ideal, it is quicker for me to adapt Basic than it would be for me to learn a new language. Also I rarely attempt to make my program's understandable to others because there is no need. All I need is something that will give me the answers I require in the minimum of time.

So for me, the 'best' language is Basic, and the 'best' way to write a program is without any regard for the rules of structured programming.

Dr M Bailes
Wiltshire

BBC ON TV

Sir, This unit is currently studying the possibility of superimposing a BBC micro 'screen' onto an existing television picture. While we realise the technical difficulties involved in providing a synch pulse and actually mixing the two video signals, we believe that it is technically possible.

What we are lacking at the moment is a comprehensive technical description of the video output stage of the BBC including some details of the video processor IC. We are looking at the idea of substituting the clock pulse into the processor with one provided by a synch pulse generator, the input of which will be from the television picture.

We would be grateful if you could provide the necessary information, or if you do not possess it, recommend a source from which we may obtain it.

Capt D J Hutton
REME Wing
The Royal School of Artillery
Wilts

Jim Day, Senior Design Engineer at the BBC Design Group, replies: In order to superimpose or mix two video signals it is necessary to synchronise their timings.

This is done by a process called 'genlock'. In simple terms, one of the sources is treated as the master and the other is shifted until it is synchronised. Genlock boards for the BBC micro are available from a number of manufacturers for under £200. With a genlock board fitted it is only necessary to ensure that colour information is present on the video output. This is done by fitting a link inside the micro. Once genlocked, the BBC micro can be treated as any other video source and fed to a mixer.

Using genlock, the BBC micro provides graphics for dozens of BBC TV programmes including *Crimewatch*, *Body Matters* and many children's programmes in addition to the familiar computer programmes.

DRIVE SLOWLY

Sir, Stuart Birkett's letter in December 1986 *Acorn User* makes heavy weather of a simple problem. The reason 40/80 switchable drives will not work in 40 track on the Master is because the configuration speed setting is incorrect.

When I first got a Master with the 1772 DFS installed, I had exactly the same problem (the 1770 DFS had slower times). On configuring the Master to FDRIVE 0 instead of 3, the problem went. The reason is rather obvious: the disc drive needs more time to jump alternate tracks, as it does when switched to 40 track. The speed reduction is somewhat kinder to the disc drive, and does not slow down the disc drive operation to any measurable extent. For those readers who still have problems, Acorn have produced another DFS ROM for the Master, which has much slower timings, and will enable 'slow' disc drives to work with the Master.

Martin Phillips
Hessle

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MD802G	Dual 400K 3½" Floppy+P.S.U.	£239.95
COMBO C	3½+5¼ Floppy in Dual Format	
COMBO E	3½+5¼ Floppy in Dual Format+P.S.U.	
COMPACT 5¼ SINGLE	Master Compact with internally fitted single 5¼ floppy. †	£499.95
COMPACT 5¼ DUAL	Master Compact with internally fitted dual 5¼ floppy. †	£639.95
†No monitor supplied.		

All prices include V.A.T.

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TEXAS TALKING

Sir, While looking through some back issues of *Acorn User*, I noticed an article by Joe Telford in which he stated that he had extra speech extension accessories plugged into his 'speech extensions ashtray'.

Since buying the Acorn Speech chip a few years ago I have not seen any of the promised extension plug-in ROMs. Have I missed the adverts somewhere? Any help on this would be appreciated as I am sick of hearing the limited vocabulary in the current Speech chip.

Timothy Gray
Al Ain
Abu Dhabi

Joe Telford replies: My extra modules are standard Texas Instruments speech ROMs, each containing about 128 different words, in an American accent. Any Texas Instruments HQ worldwide should stock them.

After I'd bought them I found there was no speech ROM cartridge available, so I had to build one on Veroboard, using the Speech ROM Guide and the Acorn circuits as a basis. These then plugged into the 'ashtray', as many call the speech ROM socket.

Their vocabulary ranges from dedicated anti-weapons information – 'Missile... at... tango... alpha... seven... zero... warning!' – to general weather information, car mileages, etc. Three things conspired to make me decide not to write a full article on these ROMs. The first was the lack of a cartridge, the second, the apparent decision by Acorn to drop the Speech system from future products. And the third, the development of *Speech!* by Superior Software. This cheap (£11) disc contains a ROM image or relocatable machine code program which integrates into any BBC micro language. By simply typing *SAY, followed by text, the computer will speak words with little problem (although I recommend a large extension speaker for clarity).

I think that a number of educational programs using *Speech!* may soon be available, as a number of local education authorities have in fact bought licences from Superior Software.

KEEPING IN TOUCH

Sir, I was pleased to read the review of our Touchtech 501 touchscreen in the November issue of *Acorn User*. At Microvitec we never tire of hearing how successful and enjoyable both teachers and pupils find this product.

However, I was surprised by the comment about a lack of software. Since the Touchtech 501's launch, two years ago, the number of packages available for it has grown exponentially. To date, there are over 50 packages available on the market.

A full list of software, suitable for use with our Touchtech products, is available by contacting the sales deparment on (0274) 390011.

J W Whitson
Marketing Manager
Microvitec
Bradford

LOCKED UP DATA

Sir, In June I upgraded my model B for a Master and sent my *Datagem* carrier board with a cheque for £25 to Gemini for exchange to a Master compatible cartridge. After three weeks I rang them and was told to wait another two to three weeks as they were having manufacturing difficulties. This scenario continued until mid-September at which point I left the country on business.

On my return to the country in the first week of November, I could get no reply from Gemini and subsequently found out they had gone bust.

Apart from my obvious gratitude to Gemini, I now have unique data on disc I cannot gain access to and would be grateful if any other *Datagem* user could possibly let me use the board to obtain hard copy so I can transfer my data to another database.

Dr J S Noake
Mid Glamorgan

Minerva Systems has taken over the support of Datagem. The company can be contacted at 69 Sidwell Street, Exeter, Devon EX4 6PH. Tel: (0392) 37756.

NIGHTMARE PROBLEMS

Sir, I am going crazy! In the December issue of *AU* there was a listing for a game which looked and sounded better than some of the games I'd bought. But, I thought, a listing won't work if I type it in. In the end curiosity got the better of me and I started to type it in.

Finally finished, I tried to run it, but, of course, it didn't work. I put that down to my error, so I did some verification checks. I went over each listing checking for mistakes. I found quite a few and corrected them, but it still doesn't work!

I am sure every line that I typed in is correct, but I'm no program expert and it would take me years to learn what every line does. So I was hoping that you could do it for me. I know you at *AU* are probably very busy, but I don't know what else to do. It seems such a stupid waste spending so much time typing out something from a magazine and then finding out it doesn't work.

I have a BBC B+128k machine with 1770 DFS and a BBC 40T SS 100k disc drive.

Howard Gayle
London

Mark de Weger writes: I hope you have not gone crazy yet. Apart from an error in the adaptions for tape users, which was caused by the editing of the listings and subsequently corrected in the January issue, all *Castle of Nightmares* listings were correct. I took a look at the programs you sent me and discovered some errors which caused the programs not to run.

If you ran program 1 a message *Checksum error – please check assembler listing to label 'delete'* was given. This meant there was an error in the assembler section of the program. Debugging programs of the size of *Castle of Nightmares* can be quite a job, so here are a few tips:

- **Always carefully read the part of the article on entering the listings. Sometimes tips are also given on the yellow pages.**
- **Some time ago Tessie Revivis covered the subject of debugging programs in her First Byte column.**
- ***Acorn User* sells booklets with checksums for all programs from a particular issue for only 24p. See page 21 for details.**
- ***Acorn User* Reader Services solves many problems (not too long or complicated please, there are limits even to the intellectual abilities of the Technical Editor!) for only £3.**

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RESCUED DISC FILES

Sir, Is it possible to rescue the files on a disc which has a corrupted catalogue, ie, a fault at track 00 sector 00?

J Richardson
Hawera, New Zealand

It is possible to retrieve the disc – just not very easy. You will need a disc sector editor (eg, in *Acorn User* March 1986 or a utility such as ACP's *Advanced Disc Toolkit*) and you must go through the disc one sector at a time looking for your programs. When you have found the start and end sectors, this information, plus the start address, execution address and length of the file must be written back into the catalogue sector.

FORTRAN AT HOME

Sir, I would like to comment on Joe Telford's remark (December) that no home users had any use for Fortran.

My own history in computing has obviously had an influence on my opinions. I started with mainframe (IBM) programming in 1960, strictly as a user. Of course, Fortran was the only sensible language to use. In 1964 my section bought a DEC PDP8 and the only language we could use on it was PAL, the machine code symbolic language. When we upgraded to PDP11s in 1971, Fortran again became available to us and I used a mixture of machine code and Fortran (IV and 77). We had Basic, but it was so slow and so markedly inferior to Fortran that one go at it was enough!

It is obvious to me why no one wants to use Fortran with BBC computers. I doubt whether many BBC users have ever tried it; after all, it's only available on some of the very expensive second processors. This is a great pity because all compiled languages are far faster than interpreted ones and Fortran is *much* faster than even compiled Basic.

Fortran is enormously more flexible than Basic. I am sure we would never have had all the fuss about the lack of structured programming if micros had been set up with Fortran instead of Basic.

So, as to Joe's question, what applications would micro users make of Fortran? If it was available to us in all its glory I would suppose that all programs which are today written in Basic would be written in Fortran instead. Roll on the day, therefore, when we can have Fortran 77 on our BBCs!

J G Cuninghame
Oxon

Joe Telford replies: Like you, my earliest programming experiences were of Fortran. Sadly, the current microcomputer user has little opportunity to use Fortran, mainly because of the complexity of funding and setting up a system capable of running Fortran. Another problem is the speed of processing and shortness of memory of many micros, which does not facilitate Fortran use.

To be honest, though, the majority of micro users are hobbyists with little education in terms of languages other than Basic. The hobbyist micro market moves at the pace of the average user, and you might see the humour in an analogy between its speed and that of Basic in comparison to Fortran.

I stand by what I said in general terms, but your letter reminds me that generalisations can be dangerous.

PAPER SIZE PROBLEM

Sir, I have a Panasonic KX-1080 printer and am very pleased with it. However, the internal DIP switches can only be set for 11 or 12 inch paper, but A4 is 11.75 inches long. Why does the printer not easily let you use A4?

N R Honan
London

Continuous paper is usually sold with pages 11 or 12 inches long, so if you are using A4, you have to feed the sheets in separately. The switch is there so the printer can automatically skip over the perforations in the paper. If you are processing words, use the command SHEETS to print a single sheet in *View* or '‹f1› EM ‹f2›' in *Wordwise*.

WORDWISE WISDOM

Sir, I have a Juki 6000 daisywheel printer, BBC model B and *Wordwise +*. I use the following heading:

‹f1› ES34 ‹Return›
‹f1› EP ‹Return›
‹f1› DH ‹f1› LL66 ‹f1› PL72 ‹Return›

For non-*Wordwise* users, this enables paging, defines a centralised heading, sets the left margin to 15, the line length to 66 and the page length to 72. The ES34 is needed as the printer has no internal switches to enable auto-linefeeds.

Although I set PL72, the first page is still 66 lines long. Is this a bug?

D F Brock
Ipswich

No, just put the ‹f1› PL72 ‹f2› as the first command in the list, so *Wordwise* 'knows' the page length straight away.

HBBS BULLETIN BOARDS

Sir, The following is a list of some of the new HBBS Bulletin Boards:

HBBS 1 Bradford, 1200/75 and 300/300, No 0274 42957. Sysop: Oscar Brumwell (author of HBBS!)
HBBS 2 Aberdeen, 1200/75 and 300/300, No 0224 632570. Sysop: Graeme Findlay.
Madhouse, 1200/75 and 300/300, No 061-477 8405. Sysop: Keith Anderson
Infocom, 1200/75 and 300/300, No 021–476 9881. Sysop: Karl Bienvenue
Techno – Fresh, 1200/75 and 300/300, No 0570 423082. Sysop: Llew Dickinson
HBBS 6 Knaresborough, 1200/75 and 300/300, No 0423 865392. Sysop: Ian Doz
HBBS Circuit Board, 1200/75 and 300/300, No 0843 297204. Sysop: James Brett

I would also like to say, on behalf of the sysops, that we all think that *AU* is splendid and we look forward to a regular Comms section.

Oscar Brumwell
Bradford

VIEWDATA ROM

Sir, Since winning a modem in an *Acorn User* competition, I have become very interested in communications, and at present I am writing a viewdata/scrolling terminal ROM.

I would like to hear from readers who have suggestions about the sort of features they would like to see on such a scrolling terminal.

I can be contacted via Prestel mailbox 919992975, or by snail-mail at 81 Dark Lane, Romsley, West Midlands.

Andrew Noakes
Romsley

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Viglen

SYSTEMS

COMPLETE SYSTEMS FROM VIGLEN

The following systems come complete with the BBC Master and drives fitted in the Viglen Master Console unit.

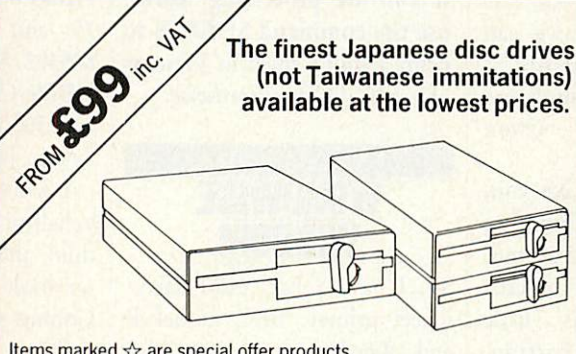
Stock Code	Description	Price inc. VAT
V250	Viglen Master System 1 This system includes: BBC Master128K in Console unit Single 400K (760K double density) 40/80 disc drive. Philips BM7502 Hi Res Green Screen Monitor	£689.00
V251	Viglen Master System 2 This system includes: BBC Master 128K in Console unit Dual 800K (1520K double density) 40/80 disc drive Philips CM8501 Standard Res colour Monitor	£879.00

Other systems can be tailor made for your requirements, 3½" drive can be supplied instead of 5¼" at the same price. Please call.
To complete the system you only need to add a printer from any of the range. The current special offer printer that's particularly suited to the packages is the Centronics GLP at £119.95 inc. VAT.
Please add £12.00 for insured courier delivery.

DISC DRIVES

FROM £99 inc. VAT

The finest Japanese disc drives (not Taiwanese immitations) available at the lowest prices.



Items marked ☆ are special offer products.

All disc drives are supplied with a manual, packed utilities disc and a full 12 Months warranty (2 Year Warranty available) and are ready to plug in and use on a BBC B (fitted with a DFS) B + or Master micro.
40/80 Track drives have a switch which enables operation in either 40 or 80 track mode.
The capacities quoted are given in single density mode; for double density mode (1770 DFS + ADFS as in the Master) the capacities should be approximately doubled.
An integral power supply is not necessary as the disc drives run from the micro's power source however should you require drives with their own power supply, these are also available.
If your BBC B micro does not have a DFS fitted then you will also require the Acorn dfs kit.

Stock Code	Description	Price inc. VAT
SP014☆	Single 400K Viglen 40/80T Drive	£99.00
SP019☆	Dual 800K Viglen 40/80T Drive	£189.00
V001	Single 100K Viglen 40T Drive	£99.95
V031	Single 100K Viglen 40T Drive + PSU	£129.95
V034	Single 400K Viglen 40/80T Drive	£114.95
V035	Single 400K Viglen 40/80T Drive + PSU	£134.95
V039	Dual 800K Viglen 40/80T Drive	£219.95
V040	Dual 800K Viglen 40/80T Drive + PSU	£259.95
V060	Single 3.5" 400K Drive	£109.95
V062	Single 3.5" 400K Drive + PSU	£129.95
V061	Dual 3.5" 800K Drive	£189.95
V063	Dual 3.5" 800K Drive + PSU	£229.95
V502	1770 or 1.2 DNFS Kit	£49.95
V503	Acorn ADFS Rom	£29.95

Please add £8.00 for insured courier delivery.

PRINTER STANDS

TABLE

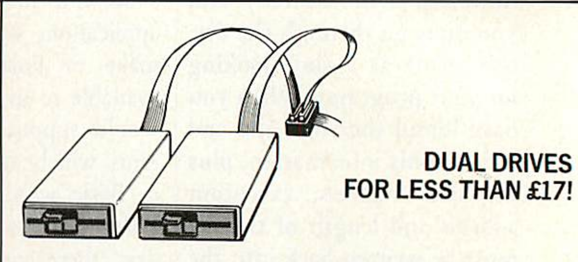
CLEAR PERSPEX PRINTER STAND

The Viglen printer stands are beautifully finished in clear perspex and raise the printer high enough to put continuous stationary underneath.

Stock Code	Description	Price inc. VAT
V490	80 Column Printer Stand (15" × 13" × 3.5")	£19.95
V491	136 Column Printer Stand (23.5" × 13" × 3.5")	£27.95

Please add £3 P & P

DUCKS



DUAL DRIVES FOR LESS THAN £17!

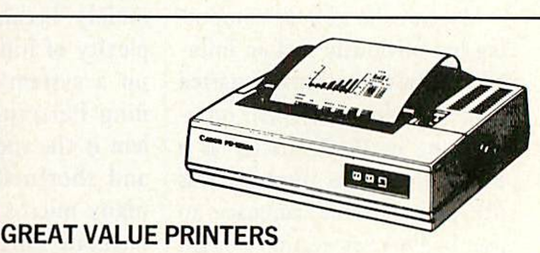
The Viglen Data DUCK (Dualling Up Connector Kit) converts any two single drives to a dual drive instantly. Simply plug the duck into the micro's disc drive socket and plug two single drives (any type and any make) into the duck to obtain a dual drive system accessed as drive 0 (and 2 if double sided) and drive 1 (and 3 if double sided). If neither single drive has its own power supply then you will require a Viglen power DUCK in order to obtain two disc drive power sockets from the micro.

★ No soldering simply plugs in.
★ No need to take disc drives apart to change links.

Stock Code	Description	Price inc. VAT
V084	Viglen data duck	£16.95
V085	Viglen power duck	£8.00

Please add £2.50 for P & P.

PRINTERS



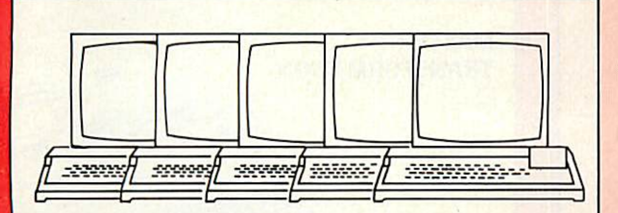
GREAT VALUE PRINTERS

Stock Code	Description	Price inc. VAT
Dot Matrix Printers		
V410	Canon PW1080A/TaxanKP810	£259.00
V409	Centronics GLP	See Special Offer Box
V420	Epson LX86 with tractor feed	£269.00
V421	Epson FX800	£379.00
V422	Epson LQ800 (200 cps)	£559.00
Daisywheel Letter quality printers		
V400	Juki 6100	£279.00
Ribbons		
V462	Canon PW1080A/Taxan KP810 ribbon	£5.95
V463	Epson MX80/RX80/FX80/FX85 ribbon	£6.00
V464	Centronics GLP ribbon	£3.95
Printer cables		
V495	BBC micro/ Master printer cable	£8.00
V497	Master Compact printer cable	£8.00

Please add £8.00 for insured courier delivery and £1.50 for ribbon.

THE VIGLEN RANGE

MICROS



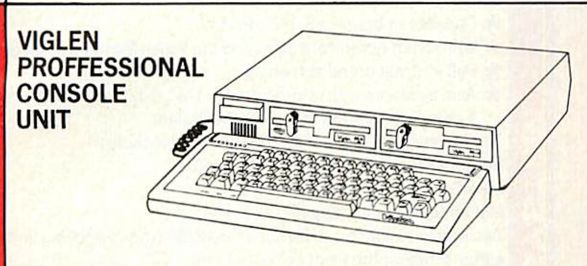
BBC MICROS

Stock Code	Description	Price inc. VAT
V210	BBC Master 128K	£459.00
V204	BBC Master COMPACT entry system	£442.75
V205	BBC Master COMPACT TV system	£458.00
V206	BBC Master COMPACT Monochrome system	£539.35
V207	BBC Master COMPACT Med Res Colour sys	£688.85
V208	BBC Master COMPACT Std Res Colour sys	£621.75

Please add £8.00 for insured courier delivery.

BBC CONSOLE UNIT

VIGLEN PROFFESSIONAL CONSOLE UNIT



Your BBC micro can be given the professional PC-look by replacing your existing lid with this smartly styled package which can house two disc drives, the Viglen Rom cartridge system, most internal boards and can support monitors including 14" television sets.

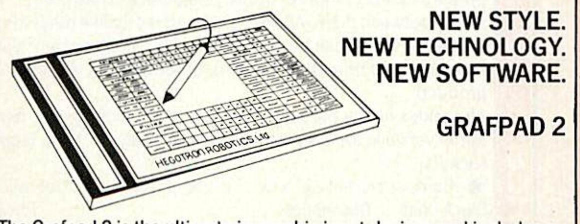
PCU Package includes: Keyboard case, Metal screened main unit, casing including internal fittings, 2 meter coiled cable to connect main unit to keyboard, blanking plates to blank out disc drive apertures, Keyboard label.

Other accessories are also available including units fitted with single or dual drives.

Stock Code	Description	Price inc. VAT
V851	Viglen Professional Console unit for the BBC micro (PCU)	£49.00
	Accessories for the Professional Console unit	
V852	2 Meter coil cable on its own	£15.00
V853	Dual drive data cable for console unit	£9.00
V854	Dual drive power cable for console unit	£5.00
V855	Power supply for PCU (capable of running two 1/2 height drives)	£32.00
V856	Fan kit for PCU (only necessary if your BBC normally gets extremely hot)	£29.00
V857	Extension keyboard on its own including coiled cable.	£29.00
V858	Fitting bracket for 3½" drive	£9.00
	Fitting service available from	£15.00

Please add £6.00 for courier insured delivery.

GRAPHICS



NEW STYLE. NEW TECHNOLOGY. NEW SOFTWARE.

GRAFPAD 2

The Grafpad 2 is the ultimate in graphic input devices and includes a new powerful art package allowing you to draw and paint in numerous colour and pattern combinations. Other facilities include copying, inverting, mirror imaging and flipping any part of your picture. The software comes on Rom and disc.

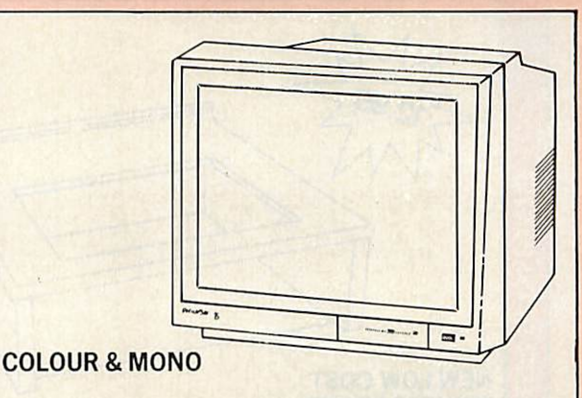
It's fast, easy to use and all commands are selected directly from the tablet, even text and numerics. Just point the pen and click the switch.

Resolution: 1280 × 1024 pixels.

Stock Code	Description	Price inc. VAT
V568	Graphpad 2	£75.50

Please add £8.00 insured courier delivery.

MONITORS



COLOUR & MONO

All the following monitors are supplied with a cable to fit the BBC micro/ Master and Compact.

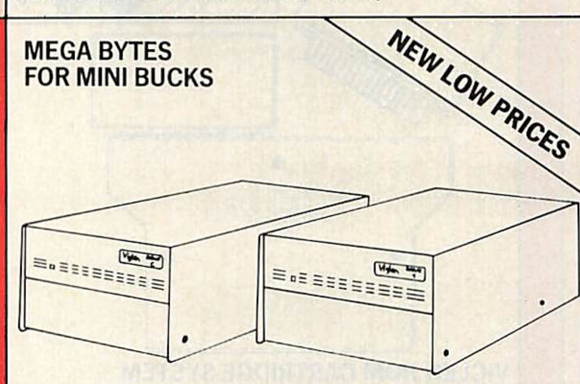
Stock Code	Description	Price inc. VAT
	Monochrome Monitors	
V331	Philips BM7502 Hi Res Green	£85.00
V332	Philips BM7522 Hi Res Amber	£95.00
V333	Taxan KX1201 Hi Res Green	£89.00
	Colour Monitors	
V345☆	Philips CM8501 Std Res Colour Monitor	£149.00
V346	Philips CM8533 Med Res Colour Monitor	£289.00
V300	Microvitec 1431 Std Res Colour Monitor	£209.00
V301	Microvitec 1451 Med Res Colour Monitor	£259.00
V304	Microvitec 1451APL Med Res Colour Monitor with PAL	£299.00
V302	Microvitec 1441 Hi Res Colour Monitor	£425.00
V356	Taxan Super Vision II	£339.00
V357	Taxan Super Vision III	£369.00

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WINCHESTERS

MEGA BYTES FOR MINI BUCKS

NEW LOW PRICES



Plug in 20 to 112 Megabytes of extra storage with the Viglen Winchester system.

The Viglen Winchester is ready to plug in and use on a BBC Master micro; for a BBC B or B plus you will merely need to fit the Acorn ADFS Rom. The Winchesters are 100% compatible with the Acorn Winchester and Acorn ADFS and will also work with the Acorn Master 512 board with DOS plus.

Drive 1 Winchesters are also available for backup or just more storage and simply plug into the back of the Drive 0 unit.

The Winchester package consists of: Winchester unit (cased with controller boards, power supply and fan), Master reference Manual part 1, Winchester user guide and Winchester utilities on disc (such as formatter, verifier, ADFS menu and sophisticated backup program allowing you to make fast backups on DFS discs, ADFS discs or Drive 1 Winchester.)

Stock Code	Description	Price inc. VAT
	Drive 0 Single	
V150	VB20 20Meg Viglen Winchester	£699.00
V152	VB28 28Meg Viglen Winchester	£759.00
V155	VB40 40Meg Viglen Winchester	£1045.95
V156	VB56 56Meg Viglen Winchester	£1119.95
	Drive 1 Second Drive	
V160	VB120 20Meg Drive 1 Winchester	£599.00
V162	VB128 28Meg Drive 1 Winchester	£649.00
V165	VB140 40Meg Drive 1 Winchester	£819.95
V167	VB156 56Meg Drive 1 Winchester	£899.95
V503	Acorn ADFS Rom and Manual (Only necessary for BBC B or B Plus	£29.95

Please add £8 for insured courier delivery.

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PRINTER STANDS

12.95

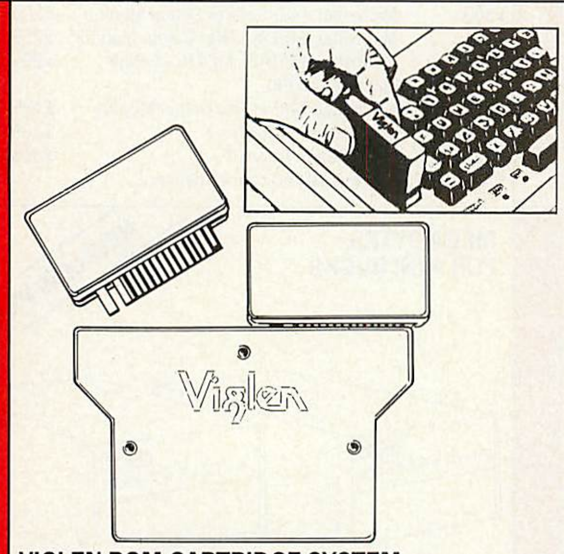
NEW LOW COST PRINTER STAND

The Viglen low cost 80 column printer stand is made in high impact ABS plastic colour matched to most printers. It raises the printer high enough to put continuous stationery (up to 1000 sheets) underneath.

Stock Code	Description	Price inc. VAT
V492	Viglen low cost 80 column printer stand (15" × 14" × 5")	£12.95

Please add £3.00 for postage and packing.

CARTRIDGE SYSTEM



VIGLEN ROM CARTRIDGE SYSTEM

Having fitted the Viglen Rom cartridge system to your BBC, Master or Master COMPACT, you can plug in your Roms/Eproms simply by inserting each one in a Viglen cartridge and plugging in whichever cartridge you want to use. The same Viglen cartridge can be used on all the micros mentioned and there is no need to switch the micro on and off between cartridge changes.

The Viglen cartridge system for the BBC micro consists of the cartridge cable assembly and socket, blanking off plates, 1 cartridge and cartridge storage rack. The cartridge socket when fitted protrudes from the rectangular slot on the left of the keyboard where the cartridges are subsequently inserted. It is simple to fit and requires no soldering.

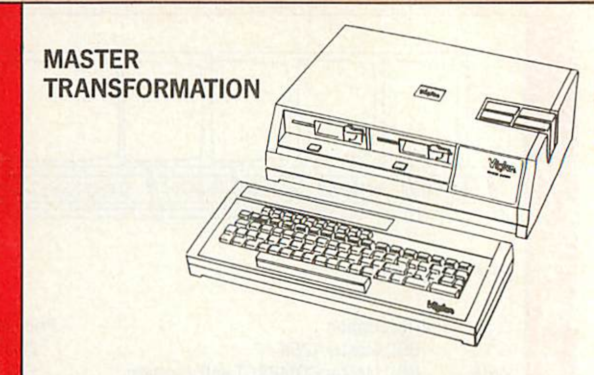
The Viglen cartridge system for the Master and Master COMPACT simply plugs into your Master cartridge slot (or COMPACT expansion port) and accepts two Viglen cartridges. On the Master you can plug in up to two Viglen cartridge systems thus giving you access to 4 Viglen Cartridges simultaneously. The system comes complete with 2 cartridges and cartridge storage rack. On the Master you can also use Viglen cartridges which have 32 and 64K paged Roms inserted.

Stock Code	Description	Price inc. VAT
V560	Viglen Rom cartridge system for BBC	£12.95
V559	Viglen Rom cartridge system for BBC (low profile)	£12.95
V550	Viglen Rom cartridge system for Master	£14.95
V551	Viglen Rom cartridge system for COMPACT	£14.95
V561	Single Viglen cartridge	£1.99

Please add £2.50 P & P (£00.50 for single cartridge).

CONSOLE SYSTEM

MASTER TRANSFORMATION



Give your BBC Master micro the professional PC look by replacing your existing lid with this smartly styled package. The system is strong and constructed in high impact ABS colour matched to the BBC Master and it gives your Master a very neat and impressive look.

* Will support monitors including up to 16" TV.
* Can house two 5 1/4" disc or Winchester drives.
* Capable of housing 3 1/2" drives.
* Will accept Acorn cartridges and the Viglen Master Cartridge system.
* Full internal metal screening.
* Also available with fitted drives (5 1/4", 3 1/2" or Winchester) or as a complete system including the Master.

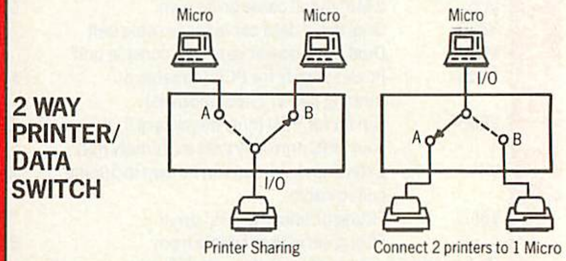
The Master console unit system package includes:
Remote keyboard case with 1.2m cable.
Metal screened main unit casing including internal fittings for 5 1/4" drives.
Two switches which can be used for 40/80 track switching and can be either fitted on the front or rear of unit.
Two blanking plates to blank out any drive aperture that is not used.
Full labelling kit.
Fully illustrated fitting instructions.

Stock Code	Description	Price inc. VAT
V861	Viglen Master Console unit	£59.00
Accessories for the Master Console unit		
V853	Dual Drive data cable for console unit	£9.00
V854	Dual Drive power cable for console unit	£5.00
V855	Power supply for the console unit	£32.00
V866	Fan Kit for console unit	£29.00
V858	Fitting bracket for 3 1/2" drive	£9.00
	Fitting service available from	£15.00

Please add £8 for insured courier delivery.

SWITCHES

2 WAY PRINTER/ DATA SWITCH



The Viglen 2 Way Printer/Data Switch allows you to connect two printers to one computer or two computers to one printer, and to switch between them. All lines are switched (unlike other models) and hence the switch can be used with a combination of any type of computer and printer (or modem, or terminal, or any other data product).

All sockets on the parallel switch are centronics 36 way, female type. Serial versions are also available with 25 way "D" type, female sockets.

* Compact size 7³⁄₁₆" × 5" × 2". * Push Button Operation.

Stock Code	Description	Price inc. VAT
V2000	PAB2 Parallel 2 Way Printer/Data Switch	£49.95
V2001	SAB2 Serial 2 Way Printer/Data Switch	£59.95
CABLES		
V0493	36 Way Centronics to Centronics cable	£ 9.95
V0494	25 Way D Type Serial to Serial cable	£10.95
V0495	BBC to Centronics Cable	£ 8.00
V0496	BBC to 25 Way D Type Serial Cable	£ 8.95
V0498	IBM PC to Centronics Cable	£14.95
V0499	IBM PC to 25 Ways D Type Serial Cable	£10.95

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PRINTER

Special Offers





THE NEW GLP II +



The new GLP II Dot Matrix Printer plus accessories now replaces the highly successful GLP Printer. At the special offer price it gives incredibly value for money. Just look at these features:–

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- ★ Prints 80 column on normal paper (A4 sheets, continuous stationery or roll paper.)
- ★ Bi-directional logic seeking.
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Offer includes:

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FREE Printer Cable.
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No extra's needed, just plug in and use. It also works with the Electron, fitted with the Plus One Interface.

Stock Code	Description	Price inc. VAT
V408	GLP II Plus accessories	£159.95

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Viglen

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Hanwell, London. W7 2QA
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Fax: 01-574 5126



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Simply fill in the coupon or write to us with your requirements enclosing a cheque/postal order or your credit card no. for the total amount. Don't forget to add the cost of delivery. Viglen endeavour to despatch all credit card orders within 24 hours.

Credit card holders may order by telephone on our sales hotline 01-843 9903 (8 lines).

Orders from overseas should be exclusive of VAT (Please deduct 15% from the total cost).



Dealer and Trade Enquiries Welcome.

Showroom Opening Times
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Items marked ☆ are special offer products.

OFFICIAL ORDERS

Official orders from **education establishments,** Government departments and Plc companies accepted. Viglen has a special education department to process orders and queries from schools, colleges, universities and Local authorities so please ask for our education department when you call. Being one of the major suppliers to the Education market, the experienced Viglen team will be able to understand and help you with your requirements.

Fill in and post to **Viglen Ltd., Unit 7, Trumpers Way, Hanwell, London W7 2QA. Tel. No. 01-843 9903.** Please make cheques and postal orders payable to Viglen Ltd.

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Total ______

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Viglen

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Reference Manual Part 2	£14.95
6502 Second Processor	£179.00
Z80 Second Processor	£379.00
Acorn Prestel Adaptor	£125.00
Acorn Teletext Receiver	£135.00
Winchester Disk Drive 10 MBYTES	£1250.00
Winchester Disk Drive 30 MBYTES	£1850.00
IEEE Interface	£299.00
Music 500	£178.00

ECONET ACCESSORIES

100m Cable	£89.00
Station Lead Set	£29.00
Econet Starter Kit	£99.00
Econet Bridge	£199.00
Level I Fileserver 40 Track	£99.00
Level 2 Filesaver 80 Track	£235.00
Print Server Eprom	£49.00

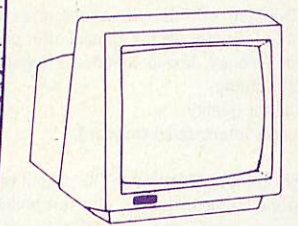
BBC Upgrades

64K Upgrade Kit	£39.95
17/70 Upgrade Kit	£49.94
ADFS ROM	£29.95
Disc Upgrade Kit	£89.00
Econet Upgrade Kit	£49.00
Speech Upgrade Kit	£49.00
DNFS ROM	£20.00

Monitors

MONOCHROME MONITORS

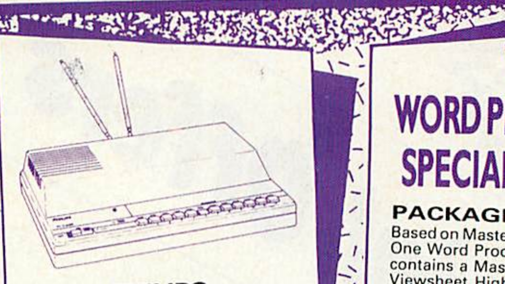
Phillips BM 7502 Green Screen	£79.00
Phillips BM 7522 Amber Screen	£95.00
Kaga KX 1202G Hi Res Green	£120.00
Kaga KX 1203G Ultra Hi Res Amber	£120.00



Hantarex H x 12 Dark Gloss Screen high resolution monochrome monitor 12" Composite Video & Audio input **£75.00**

COLOUR MONITORS

Microvitec 1431 Std Res	£201.25
Microvitec 1451 Med Res	£270.25
Microvitec 1441 Hi Res	£391.00
Microvitec 2030 Cs 20 Std Res	£425.50
Microvitec 1431 AP Std Res	£224.25
Microvitec 1451 Ap Med Res	£293.25



PHILIPS MONITOR TO TV CONVERTER
£69.00

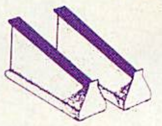
HOW TO TURN A DEDICATED MONITOR INTO A FIRST CLASS TV SET?
SIMPLY SLIDE THE SWITCH ON THE TV TUNER.
The Philips AV 7300 TV tuner turns any colour monitor (with CVBS and audio inputs) into a first class TV set, giving you extra versatility and value from your monitor. A convenient TV/computer switch allows the tuner to stay permanently connected to the computer and at the same time to a TV antenna.

TV MONITORS
Philips 1114 colour TV/monitor with 14" tube offering 10 Preselect channels RF CVBS and RGB inputs **£199.00**

TCL WORD PROCESSING SPECIAL PACKAGE

PACKAGE 1
Based on Master 128. The TCL All in One Word Processing Package contains a Master 128, View 3.0, Viewsheet, High Res Green Monitor, 800K Dual Drives with PSU, Quendata Daisy Wheel Printer together with a box of Discs, Paper, and all the Cables. **£899.00**

PACKAGE 2
Based on Master Compact 128. The TCL package includes Compact 128, latest version of the View Word processor, single 640K disk drive, monochrome monitor, correspondence quality printer. All connecting cables for above and also 5 disks and some paper. **£635.00**



PRINTER STAND
Fits nearly any width of printer. Allows paper storage and gives ideal viewing position. Can also be used for computers and monitors. Steel construction prevents bending or buckling **£18.00**

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BBC MASTER COMPACT

Twillstar continues to offer the MASTER COMPACT for your Home Education and Business needs! Complete with bundled software and an integral 3.5" Disk Drive in the following Systems:-

SYSTEM 1 (inc. VAT) **£414.00**
128K *Single 640K Drive* *UHF Modulator* *Bundled Software*

SYSTEM 2 (inc. VAT) **£488.75**
As System 1. With *12" High Res. Monochrome Monitor*

SYSTEM 3 (inc. VAT) **£626.75**
As System 1. With *14" Medium Res. RGB Monitor*

SPECIFICATIONS: ★ Compatible with Master Series micro subset ★ 128K RAM inc 64K sideways RAM ★ 64K ROM inc 32K MOS, 16K BASIC ★ Up to 4 internal ROM sockets ★ 3.5" 640K formatted disk drive ★ OUTPUTS: Video/RGB/Printer/Mouse or Joystick ★ Disk drive ★ (optional) Econet ★ Serial ★ 5V power from disk drive module ★ Usual 8 BBC disply modes inc. Mode 7 ★**BUNDLED SOFTWARE:** Pull down menus * Desk top inc. note pad, calculator * VIEW 3.0 * CARD INDEX * Full LOGO * BBC BASIC4.0 * ADFS + Utils * Welcome suite * Tutorials * (1770 DFS under licence)

2nd DRIVE KIT **£113.00**

Phillips CM 8533 Med Res monitor with dark glass etched screen composite video input RGB and Audio Input. **£289.00**

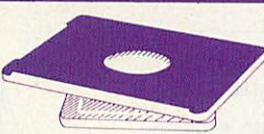
OUTSTANDING PERFORMANCE OUTSTANDING VALUE
Just released by Hantarex 14" Colour Monitor Standard Resolution RGB PAL Audio Input (Inc. VAT) **£175.00**

SPECIAL OFFER
Mitsubishi 1404 Medium Resolution Monitor with 640 X 200 Pixels RGB available with IBM or BBC Leads. **£229.00**

Taxan Super Vision 620



High Resolution colour monitor with several unique features, at an affordable price.
SUPERVISION 620
12" RGB High resolution colour monitor. Fully compatable with IBM, Apple, BBC and most other Personal Computers. 635 x 312 line resolution. Positive or negative sync input. Text colour switchable to green, amber, white or blue or inverse white. Super high contrast tube. Optional tilt-swivel base (with clock/calendar available). Special introductory offer. **£299.00**



SWIVEL BASE
Tilt and swivel base for 12" or 14" monitor or TV. "Looks very elegant" **£17.25**

Disc Drives

MITSUBISHI DISC DRIVES
User Friendly Disk Drives 100% BBC compatible slimline disc drives. All drives are supplied complete with formatting diskette, comprehensive users manual and all necessary cables. All drives are 40/80 Track switchable at the front and have two years warranty.

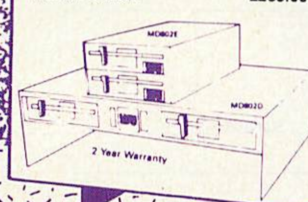
5¼" Drives without P.S.U.

MD 400A Single 400K Double Sided	£118.00
MD 802C Dual 400K Double Sided	£219.00

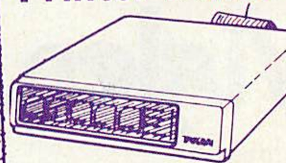
5¼" Drives with P.S.U.

MD 400B Single 400K Double Sided	£135.00
MD 802E Dual 400K Double Sided	£249.00

SPECIAL
MD 802D Dual 400K Drives horizontally mounted in a monitor stand to fit both the BBC B and the Master series. **£289.00**



Printer Buffer



Now available
Taxan Multipurpose Type Printer Buffer KIF-4308 compatible with any Centronics interface printer **£149.00**

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The latest range of Software
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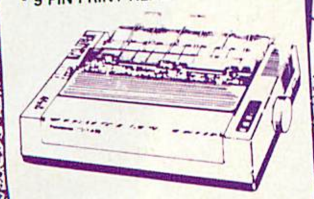
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Repairs for computer printers and disk drives. Call
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and ask for our engineering depatment.

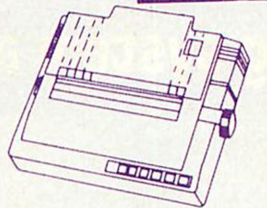
Printers

KX-P 1080 DOT MATRIX PRINTER

- NEAR-LETTER QUALITY PRINTING IN ALL PITCHES
- OPERATOR ACCESSIBLE PRINT MODE SELECTOR (Std./Pgm.,NLQ, Comp.)
- FRICTION FEED AND ADJUSTABLE TRACTOR ARE STANDARD
- WORD PROCESSING FUNCTIONS (Justification, Centering, L&R alignment)
- PROPORTIONAL SPACE PRINTING
- HIGH RESOLUTION, DOT-ADDRESSABLE GRAPHICS
- UP TO 40 DOWNLOADABLE CHARACTERS
- COMMAND CODE COMPATIBLE WITH POPULAR PRINTER SOFTWARE
- PRINT SPEED, DRAFT: 100 NLQ: 20 COMPRESSED: 86
- 9 PIN PRINT HEAD



The Panasonic KX-P 1080 impact dot matrix printer is ideal for applications that require economical high quality printing. It offers a variety of print modes, all producing crisp clearly formed characters. Wide choice of print sizes includes semi -compressed and commpressed (even in near-letter quality printing). Operator accessible print mode selector adds convenience. For a reliable printer at an affordable price, the KX-P 1080 is always a smart choice. **£159.00**

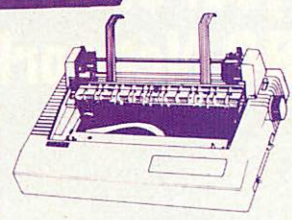


STAR NL-10

Fine Near-Letter-Quality, 100% compatibility and total reliability all in one easy to use printer. For quality, ease of operation and dependability, nothing beats the Star NL-10. You get outstanding print quality at 120 cps in draft mode and 30 cps in near letter quality. Plus, the sleek NL-10 offers full compatibility with most popular computers through plug in interface cartridges. Just insert the appropriate plug in interface cartridge for your IBM-PC, Commodore, Apple IIc or other parallel computer and your Star NL-10 is ready to print. Touch a button on the control panel to set the print pitch (3 choices), to select the typeface and to print in either draft or NLQ mode. You can even set left and right margins, make top of form settings and control forward and reverse feed in the smallest pitch. **£229.00**

ALSO AVAILABLE

Epson EX 800	£589.00
Epson FX 86	£365.00
Epson FX 105	£495.00
Epson LQ 800	£585.00
Seikosha GP 50A (Parallel)	£69.00
Seikosha GP 50S inc. Printer I/F + cables	£69.00
Canon 50A	£269.00
Canon 55A	£399.00
Star NB 15	£859.00
MP 165	£240.00



CITIZEN 120D

Dot Matrix Printer. The 120D precision printer brings to the small business, educational and home user good quality and attention to detail. Its compact size, host of standard features and built in quality and reliability that supports Citizen's unique **full TWO-YEAR warranty** make it a must for all computer users. Fast draft output: 120 cps. Built-in NLQ: 25 cps. IBM and Epson compatible. Plug-in interface cartridge. Tractor and friction feed as standard. Optional cut sheet feeder. **£179.00**

CITIZEN MSPIOE

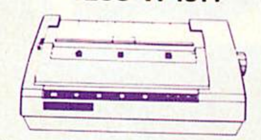
The new MSPIO with 160 CPS Draft and 40 CPS NLQ. With TWO years Warranty **£269.00**

CITIZEN MSP-15E

17" Wide carriage . 136 column, operating at 120 cps and at the push of a switch will print near letter quality at 40 cps. Fully Epson and IBM compatible. 8k of standard buffer built in. Standard Centronics are optional RS232 **£379.00**

SOURCE
The Complete Solution

INTRODUCES THE NEW TECO VP1814



Dot matrix printer. VP1814 is fast highly reliable and easy to operate.
- ☆ Standard 80 column
- ☆ The high-speed, low energy consumption 9 wire dot head gives printing speed of 189 cps and NLQ speed 36 cps
- ☆ Bi-directional, Logic seeking in text mode
- ☆ The use of fan-fold, roll or cut-sheet paper is possible with adjustable sproket pin feed and friction feed
- ☆ Offers emphasized, double print, super script, sub script
- ☆ Justified print mode are also available including left, centre, right and full justification
- ☆ 9 graphic modes are available
- ☆ Both download and inprint buffer can exist simultaneously
- ☆ 7K input buffer standard can be expanded to 15K
- ☆ Printing modes selectable at front panel (NLQ/draft, Pica/Elite, enlarge, emphasize, condense, italic
- ☆ 11 Language international character font is internalized
- ☆ Both IBM and Epson compatable

MAIN UK DISTRIBUTOR
SPECIAL INTRODUCTORY PRICE (inc. VAT) **£229.00**

HOME, EDUCATION & BUSINESS NEEDS!

EPSON LX86

High performance low on price offering an increased performance at an incredible low price. The LX 86 Dot Matrix Printer represents unprecedented value for money, with a host of built in features, increased draft speed 120 cps and correspondence quality at 16 cps printing this versatile Epson printer carries out every task with effortless style and has the highest standard of reliability. Supports both Epson and IBM character set. (inc VAT)£229.00

DOT MATRIX PRINTERS

Juki 5510 - Gives you 180 CPS & NLQ Standards £269.00 Inc. VAT

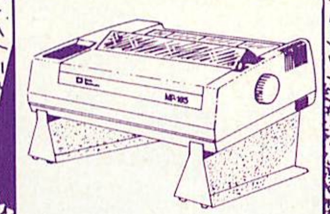
...and thats not all! The Juki 5510 also has full graphics mode, two position 'dip-switch' (providing instant compatibility with both the Epson and the IBM Graphic Printer). Standard 2K memory (expandable to 14K) built-in Parallel Centronics interface and 8-switch international character sets. If you need colour too, the optional Juki 5510 Colour Kit gives you seven colours. **£112.00**

MICRO P MP165

80 Columns. 165 cps in draft mode. 35 cps in NLQ mode. Ultra high resolution graphics. Friction and traction feed. Compatible with all major micros. Quiet and easy to use. 2 Year warranty. Epson or IBM compatible control codes. **£199.00**

MP200

200 cps in draft. 40 cps in NLQ mode. 7K buffer as standard (128 downloadable characters in NLQ) optional 8K memory. IC font cards. Auto insert–Loads paper automatically to top of form. User friendly control panel–easy print pitch selection. I/F board–quick change of interface to match applications. Cut sheet feeder (optional double bin auto sheet feeder). IBM compatuble. **£274.85**



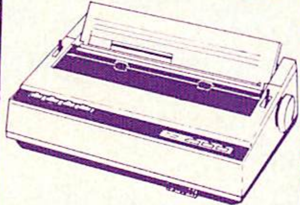
MP201

Same as MP200 with 136 columns **£318.55**

CANON PW1080A

80 column printer with 160 cps draft and 40 cps NLQ with built in friction and tractor feed. Fully compatible with Epson FX80. Standard parallel interface. **£235.00**

DAISYWHEEL



PANASONIC KX-P3131

A Fully Formed Serial Impact Daisywheel printer with print speed of 17cps. Diablo compatible print wheels. Print pitches available are: 10, 12, 15 and proportional spacing. Standard friction feed and optional tractor. Paper width 13.5 inches. Standard Centronics optional RS-232C. Built with 6K text buffer expandable to 32K buffer. **£251.30**

QUENDATA DWP 1120

with optional tractor/sheet feeder and 13" paper width facility. This Daisywheel printer with 20 CPS has 96 character printwheel compatible with the QUME. Standard centronics interface. (optional RS232 C) **£169.00**

Juki 6100	£285.00
Juki 2200	£275.00
Juki 6300	£799.00

How to Order

You can purchase any of the items listed. All you have to do is write your requirements on a sheet of paper, and we will despatch your goods within 24 hours, subject to availability. Please add the following amounts for Postage and Packing.

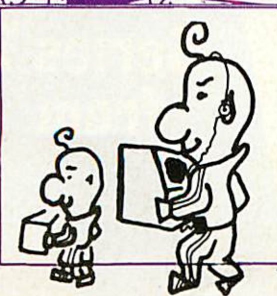
Items below £10.00	add **£1.50**
Items below £50.00	add **£2.50**
Items below £100.00	add **£3.50**
Items over £100.00	add **£8.00**

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01-571 5938 or 574 5271

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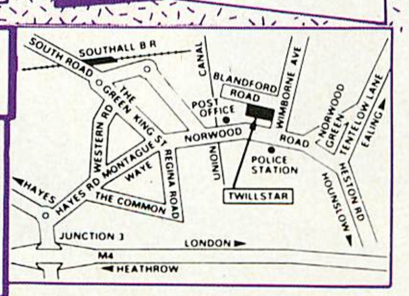
Full credit facilities now available nationwide
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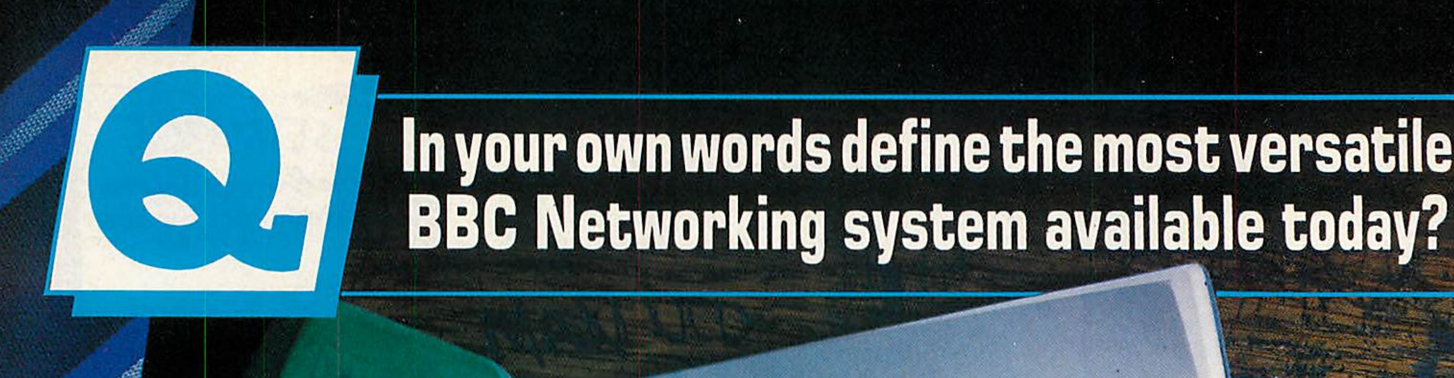
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Typical APR 36.3%





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Amcom's E-Net-The Definitive Hard-Disc Network For The BBC.

Effective networking has now truly come of age with the release of Amcom's Series 7 network software, which gives you the best of both worlds:-

Advanced features at a reduced price

Series 7 includes all the features which made E-Net so popular for use with the BBC micro and more:-

* A non-dedicated fileserver that does not require an expensive second processor, as well as running the network the fileserver can be used for system management & student control. With Series 7, more than one fileserver can operate on the network at one time, enabling more efficient & versatile networking.
* Advanced monitoring facilities giving effective teacher to student and student to teacher communication across the network, whilst retaining overall control from the fileserver with vectored monitoring of network usage.
* Remote printing and printer spooling means that there is no need for a dedicated print-server or expensive peripherals, greatly enhancing the reliability and versatility of network printing.
* System security is a priority on E-Net, using a combination of user numbers and passwords, thus providing even greater security.
* A fully hierarchical (ADFS/ANFS type) directory structure is supported whilst maintaining a high degree of DFS software compatibility.
* Series 7 enables data bridges to other networks or via modem links.
* Access by users to Acorn style low level primitives (using OSBYTE and OSWORD commands) whilst maintaining system integrity.

These innovative features are now offered at a reduced price. A 20 Megabyte E-Net Winchester costs just £1200+VAT and that includes the Series 7 Software.

Series 7 from Amcom

For more information on Series 7 E-Net, Tapestreamer back up and stand alone ADFS Winchesters contact:
Amcom Software Ltd., 35 Carters Lane, Kiln Farm, Milton Keynes. MK11 3HL. Telephone: (0908) 569212

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AMCO6 Turbo 65C02 Module	£99 (b)
ADC08 512 Processor	£195 (b)

ADF13 ROM Cartridge	£13 (d)	ADJ23 Ref Manual Part II	£14 (c)
ADF10 Econet Module	£41 (c)	ADJ24 Adv Ref Manual	£19.50 (c)
ADJ22 Ref Manual Part I	£14 (c)	View User Guide	£10 (d)
BBC MASTER Dust Cover	£4.75 (d)	Viewsheet User Guide	£10 (d)

MASTER ROM/RAM CARTRIDGES

TRC1 Two rom cartridge	£7.95 (d)
TRC4 Four rom cartridge	£9.95 (d)
TRC 32K Cartridge ind RAM.	£26.95 (d)

BBC MASTER COMPACT

A free packet of ten 3.5" DS Discs with each COMPACT"

See page 5 for details

SYSTEM 1 128K, Single 640K Drive & bundled software.	£385 (a)
SYSTEM 2 System 1 with a 12" Hi Res Monochrome Monitor.	£469 (a)
SYSTEM 3 System 1 with a 14" Med Res RGB Monitor.	£599 (a)
Second Drive Kit.	£99 (c)
Serial Kit.	£29 (d)
T.V. Modulator	£29 (d)
Extension cable for external 5.25" 80T Drive (Serial Kit).	£12.50 (d)

UPGRADE KITS

1.2 OS ROM	£15 (d)	ADFS ROM	£26 (d)
DNFS ROM	£17.50 (d)	1770 DFS Kit	£43.50 (d)
BASIC II ROM	£22.50 (d)	Econet Kit	£55 (d)

ECONET ACCESSORIES

Econet Starter Kit	£85 (b)	Econet Bridge	£174 (b)
Econet Socket Set	£29 (c)	Printer Server Rom	£41 (d)
File Server Level II	£75 (b)	10 Station Lead Set	£26 (d)
Master FS Utility Disc	£17.25 (d)		

32016 CO PROCESSOR

For full specification see page 5 — £999 (a)

CAMBRIDGE W/STATION

For full specification see page 5 — £3,450 (a)

PANOS/PANDORA Upgrade incl 32000 BASIC FP.	£29 (d)
Co-Processor upgrade to 10 MHz operation for faster processing.	£POA (d)
Time Warp Real Time Clock with utilities for reading time and date in PANOS (for model B and B+ users).	£39 (c)
32016 Instruction Set Manual.	£25 (c)

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Acorn 30 Mbyte Winchester with File Server Level III and ADFS hierarchical filing System.	£1,529 (a)
P20HD TECHNOMATIC 20 Mbyte Winchester Drive fully compatible with Acorn ADFS and FS III. Includes ADFS Rom. Special reduced price.	£499 (a)
P204HP TECHNOMATIC 20 Mbyte Winchester and a 80T DS floppy Drive built in a monitor stand. Includes ADFS Rom.	£849 (a)
P2041HT As P204HP but also with a 10 Mbyte tape streamer backup unit and backup utilities. Includes ADFS Rom.	£1,499 (a)
TS10 10 Mbyte Tape Streamer Backup unit with utilities.	£695 (a)
TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10.	£19 (d)

WINCHESTER Drive Multiplexer

TWM2 for two computers.	£99 (b)
TWM4 for four Computers.	£159 (b)

Details on Technomatic Winchesters on page 6

SECOND PROCESSORS

ACORN 6502 2nd Processor	£173 (b)
TORCH ZEP100	£229 (a)
MULTIFORM Z80 TECHNOMATICs multi format Z80 system includes a FREE Pocket Wordstar + MS/DOS Read/Write Utility	£289 (b)

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs. — £265 (a)

TELETEXT ADAPTOR

Converts your computer into a teletext receiver.	£95 (b)
BBC Publications rom for enhanced Teletext Utilities.	£7.95 (d)

PRINTERS

EPSON LX86 120 cps, variety of fonts, including NLQ, bit image graphics, IBM char/graphics compatible, centronics interface standard.	£199 (a)
EPSON LX80/86 Tractor Feed	£20 (c)
EPSON LX80/86 Sheet Feeder	£49 (c)
EPSON FX800 NEW An enhanced version of FX85. Call for details.	£319 (a)
EPSON FX1000 NEW An enhanced version of FX105. Call for details.	£449 (a)
EPSON EX800 See details on page 5.	£409 (a)
Colour option for EX800/EX1000.	£55 (b)
EPSON LQ800 See details on page 5.	£439 (a)
EPSON LQ1000 As LQ800 but wider carriage for 136 columns.	£589 (a)
TAXAN KP815 Enhanced KP810 with 160cps and full IBM compatibility.	£249 (a)
TAXAN KP915 NEW Enhanced KP910 with 180cps and full IBM compatibility.	£369 (a)
NATIONAL PANASONIC KX P1080	£149 (a)
STAR NL 10 (Parallel Interface)	£239 (a)
STAR NL 10 (Serial Interface)	£279 (a)
EPSON JX80 colour printer	£249 (a)
INTEGREX Multicolour Inkjet printer.	£549 (a)
Ideally suited for high res colour VDU screen dumps. Quiteness & consistent output are major characteristics.	£525 (a)
BBC Screen dump for Integrex.	£15 (d)
BROTHER HR20 A new attractively styled printer from Brother with unusually quiet operation, host of new fatures, including option to copy current documents. 8K buffer standard expandable to 16K. Parallel & Serial ports as standard.	£329 (a)
STAR POWER Type A new low cost daisy wheel printer incorporating STAR technology for innovation and enhancements. Phone for details. See page 5 for details.	£229 (a)
JUKI 6100 Daisy wheel printer 15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface.	£259 (a)

PLOTTERS

EPSON HI 80 OFFER This highly popular A4 four colour plotter which offers precision and high speed plotting is offered at a never to be repeated price. A choice of pens for different applications is available.	£249 (a)
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LINEAR GRAPHICS	
A4S PLOTMATE	£370 (a)
A4SM PLOTMATE	£450 (a)
A3M PLOTMATE	£569 (a)
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PRINTER SHARERS & BUFFERS

BUFFALO PB Buffer
Parallel buffer for internal fitting to most Epson printers. Simple to instal.
PB128 (128K) — £99 (c)

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High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases. all lines fully switched.

		Parallel		Serial
3 Computers to 1 Printer	36v36-3	£69 (c)	25v25-3	£65(c)
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2 computers/2 Printers X-over	36v36-x	£69 (c)	25v25-x	£65(c)
BBC Cable set 3 to 1 (1m ea)		£32 (d)		£34(c)
BBC Cable set 4 to 1 (1m ea)		£39 (d)		£41(c)

BBC Computer Sharer: TCS26
1 computer to 2 printers fitted with BBC cable — £22 (c)

Paper & Labels
Plain fanfold paper with microperforation:

2000 sheets $9\frac{1}{2} \times 11''$	£12 (£3.50)
2000 sheets $14\frac{1}{2} \times 11''$	£18.50 (£4.50)
1000 sheets A4	£12.50 (£3.50)

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West End Branch
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(b) £2.50
(c) £1.50
(d) £1.00

DISC DRIVES

Full details on page 6.
All drives fitted with MITSUBISHI mechanisms.

5.25" Single Drives 40/80 switchable:	
TS400 400K/640K	£114 (b)
PS400 400K/640K with integral mains power supply	£129 (b)
5.25" Dual Drives 40/80 switchable:	
TD800 800K/128OK	£199 (a)
PD800 800K/1280K with integral mains power supply	£229 (a)
PD800P 800K/1280K with integral mainspower supply and monitor stand	£249 (a)
3.5" 80T DS Drives:	
TS351 single 400K/640K	£99 (b)
PS351 single 400K/640K with integral mains power supply	£119 (b)
TD352 Dual 800K/1280K	£170 (b)
PD352 Dual 800K/1280K with integral mains power supply	£187 (b)
PD853 Combo Dual 5.25"/3.5" drive with psu.	£229 (a)

DISC DRIVE MULTIPLEXER

Full specification on page 6.

TDM2 Dual Unit: 2 computers/one drive unit	£75 (b)
TDM4 Quad Unit: 4 computers/one drive unit	£135 (b)

3M FLOPPY DISCS

5.25" Discs in packs of 10	
744 40T SS DD	£10.00 (d)
745 40T DS DD	£12.00 (d)
746 80T SS DD	£14.50 (d)
747 80T DS DD	£15.50 (d)

See page 10 for details of Special Offer

(Add £1 for library case packing)

3.5" Discs in packs of 10	
80T SS DD	£20 (d)
80T DS DD	£25 (d)

BULK DISCS

High quality unlabelled discs supplied in packs of 50 in a storage box. The 5.25" discs have the reinforcing hub rings. These discs are guaranteed for life.

50 5.25" 40 T single sided discs in lockable box.	£35 (b)
50 5.25" 80T double sided discs in lockable box.	£45 (b)
50 3.5" 80T double sided discs in lockable box.	£95 (b)
FLOPPICLENE DRIVE HEAD CLEANING KIT	
5.25" Kit with 20 disposable discs	£12.50 (d)
3.5" Kit with 20 disposable discs	£14.00 (d)
DISC STORAGE BOXES	
DB340 Lockable 40 x 3.5"	£8.50 (c)
DB550 Lockable 50 x 5.25"	£9.00 (c)
DB570 Lockable 70 x 5.25"	£11.00 (c)
DB5100 Lockable 100 x 5.25"	£13.00 (c)

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BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors
Please specify plastic or metal case.

Microvitec 1431 Standard Resolution 453 pixels	£179 (a)
Microvitec 1431AP As 1431 + composite video and sound input	£199 (a)
Microvitec 1451 Medium Resolution 653 pixels	£225 (a)
Microvitec 1451AP As 1451 + composite video and sound input	£259 (a)
Microvitec 1441 High Resolution 895 pixels	£365 (a)
Microvitec 20" RGB/PAL/ Audio Monitors	
Microvitec 2030CS Standard Resolution RGB/Comp Video	£380 (a)
Microvitec 2040CS High Resolution RGB/Comp Video	£685 (a)
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	£239 (b)
PHILIPS 8501 See page 10 for details.	£139 (a)
TAXAN SUPER VISION II 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	£279 (a)
TAXAN SUPER VISION III 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	£319 (a)
MITSUBISHI XC1404 14" Med Res RGB Monitor Etched dark screen brilliance and contrast control, BBC/IBM compatible	£219 (a)
12" MONOCHROME MONITORS	
TAXAN KX1201G Hi Res green etched screen	£90 (a)
TAXAN KX1202G Hi Res Long Persistence (P39)	£95 (a)
TAXAN KX1203A Hi Res amber etched screen	£95 (a)
PHILIPS BM 7502 Hi Res green screen	£75 (a)
PHILIPS BM7522 Hi Res amber screen	£79 (a)
MONITOR ACCESSORIES	
Microvitec Swivel Base (14" plastic monitors)	£20 (c)
Philips Swivel Base	£14 (c)
Monitor Stand Models B & B+	£10 (c)
Monitor Stand Master	£13 (c)
Double Tier stand Models B, B+ or Master	£24 (b)
Taxan RGB Lead	£5 (d)
Microvitec Lead	£3.50 (d)
Monochrome BNC/Phono Lead	£3.50 (d)

EPROMS/RAMS

2764-25	£2.50 (d)
27128-25	£2.75 (d)
6264LP-15	£2.80 (d)

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2 8K Rams	£37 (c)
ATPL Battery backup kit	£16 (d)
ATPL Board for BBC+ (now in stock).	£31 (c)
TIME WARP Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	£31 (d)
Time Warp with PANOS Utilities.	£39 (d)

MODEMS

(All modems are BABT approved)
See page 7 for modem specifications

MIRACLE WS2000V21/23 & BELL stds	£95 (c)
WS2000 Auto Dial Card	£27 (d)
WS2000 Auto Answer Card	£27 (d)
WS2000 SK1 Kit	£5 (d)
WS2000 DS1 disc	£10 (d)
WS2000 Data Cable for BBC	£6 (d)
MIRACLE WS4000 V21/23	£149 (b)
MIRACLE WS3000 V21/23	£295 (b)
MIRACLE WS3000 V22	£495 (b)
MIRACLE WS3000 V22 bis	£650 (b)
WS3022 1200/1200 fd	£395 (b)
WS3024 2400/2400 fd	£570 (b)
BBC Data Cable for WS3000/4000	£7 (d)

PROGRAMMING ACCESSORIES/SOFTWARE

See page 8 for detailed specification

Compatible with B, B+ and Master

EPROMER II while stocks last.	£89 (b)
EPROMER III See page 8 for details.	Approx £119 (b)
MPROMER	£49 (c)
META ASSEMBLER	£145 (b)
PORTAL EPROM EMULATOR 128K	£185 (b)
PORTAL EPROM EMULATOR 512K	£285 (b)
TEAM Disassembler	£145 (b)
EPROM ERASERS	
UV1B 6 eproms, safety cutout	£47 (b)
UV1T 6 eproms, timer, safety cutout	£59 (b)

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CAD/DRAWING PACKAGES

NOVACAD II (Master only)	£149 (c)
NOVACAD CAD Package for B, B+ MASTER & Compact. (See page 9 for specification)	
Tracker Ball/Mouse Version (TM)	£79 (d)
TM Version plus Tracker Ball	£119 (c)
TM Version plus Mouse	£105 (c)
Plotter Driver Generator	£25 (d)
MOUSE	
AMX MOUSE with SUPER ART (pse specify B, B+ or Master)	£63 (d)
Super Art	£43 (d)
PAGEMAKER	£39 (d)
MAX	£17.35 (d)
3D ZICON	£21 (d)
PAINTPOT	£21 (d)
DATABASE	£21 (d)
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RB2 Tracker Ball with Icon Master (for B, B+ & Master)	£59 (c)
RB2 Tracker Ball with Cursor Control Rom (for Master only)	£59 (c)
RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software)	£47 (c)
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MIRRORSOFT FLEET STREET EDITOR incl VAT	£39.50 (d)

CP/M SOFTWARE

for Acorn, Torch & Multiform Z80 Processors

MICROPRO's Wordstar Professional	£310 (a)
ASHTON TATE's DBASE II	£310 (a)
SUPERCALC II	£195 (a)

Send for details on our full range of CP/M & PC DOS packages for Business, Communications & High Level Languages.

BBC SOFT/FIRMWARE

DATABASE MANAGEMENT SYSTEMS

VIEWSTORE Acorn's database with display in any mode in spreadsheet or user defined card format and powerful sort facilities. Max file size 4Mb	£37 (d)
STARdataBASE A fast machine code, true random access database. Upto 4000 records/file, 69 fields. Fully menu driven, user defined record layout, very fast searches thru keysearch facility. Mailmerging from VIEW and WW.	£49 (d)
MASTERFILE II Highly popular economically priced database. 17 fields per record, file size limited by drive capacity only. (40T or 80T) Please state DFS or ADFS.	£17 (d)

WORD PROCESSORS

VIEW 2.1	£37 (d)
VIEW 3.0	£56 (c)
VIEW INDEX	£12 (d)
VIEW PRINTER DRIVER GENERATOR	£9 (d)
DOT PRINT PLUS Full details on page 5 NLQ rom for Epson FX/RX, MX and GLP.	£28 (d)
WORDWISE	£24 (d)
WORDWISE PLUS	£38 (d)
WYSIWYG PLUS See page 7 for details.	£21 (d)
INTERWORD (If you own a WW+ then quote your reg number and pay £39).	£46 (d)
SPELLMASTER	£49 (d)
WORDEASE A 16K rom based utility for WW+	£24 (d)
SPELLCHECK III A 16K rom based spellcheck program for View and WW. Contains 2000 words on the rom and 6000 (expandable to 17000) words on a disc.	£31 (d)
EDWORD II (Please specify model B, B+, Compact or Master).	£43 (c)

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 cols and 255 rows and will operate in any mode. Fully compatible with VIEW and 6502 2nd processor.	£37 (d)
WINDOMATIC Enhances the power of Viewsheet See page 9 for details.	£15 (d)
VIEWPLOT A disc based plotting program. (To be released soon).	£22 (d)
INTERSHEET The new spreadsheet from Computer Concepts with many advanced features like 105 col mode, holding several spreadsheets in memory at a time etc.	£39 (d)
INTERCHART Graphics package for Intersheet	£27 (d)
ULTRACALC BBC Publications very popular and well proven spreadsheet rom includes graphics utility disc.	£52 (d)
QUICKCALC A disc based economically priced spreadsheet package (40 or 80T Disc).	£14.50(d)
MINI OFFICE II (for BBC B) A suite of inexpensive but extensive word processor, database and spreadsheet packages. (40T or 80T)	£14.75(d)
MINI OFFICE II (Rom)	£48 (d)

LANGUAGES

META ASSEMBLER Multi processor Assembler full details on page 8	
TEAM DISASSEMBLER	£145 (b)
MACROM A very fast full featured macro assembler rom from 6502 and 65C02 codes, allows use of macros from library disc. Assembly can be disc to memory, memory to memory, memory to disc and disc to disc thus allowing very long source code upto the length of disc in use. About 3 times as fast as ADE and 30% more economical in memory.	£33 (d)
ACORN MICRO PROLOG Logic programming language used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more friendly.	£62 (d)
ISO-PASCAL Acorn's full implementation of International Std Pascal on 2x16K roms.	£48 (c)
ISO PASCAL STAND ALONE GENERATOR	£30 (d)
OXFORD PASCAL A fast P-code compiler and stand alone utility (40 or 80T).	£36 (d)
BCPL	£46 (c)
BCPL CALCULATIONS Supports floating point, fixed point and fast integer calculations on BCPL	£17.50 (d)
BCPL STAND ALONE GENERATOR	£39 (d)
ACORN LOGO	£46 (c)
LOGOTRON LOGO	£55 (c)
BBC PUBLICATIONS OPEN LOGO	£59 (c)
ACORN LISP ROM	£39 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£43 (d)
MICROTEXT A frame based authoring system from NPL for interactive computer tutoring. Disc based	£52 (c)
MICROTEXT PLUS Extended Features incl extra memory, control of external devices etc. Rom based.	£229 (b)

COMMUNICATIONS

TERMULATOR Advanced terminal emulator which includes VT52/100, Tektronics 4010, teletype emulations.	£25 (d)
COMMSTAR A highly popular communication rom suitable for all general purpose applications (specify B or Master)	£28 (d)
COMMUNICATOR A full 80 col VT100 emulation program with easy to follow screen menus.	£49 (d)
DATABEEB A variety of facilities for use with WS2000 Modem	£26 (d)
COMMAND (specify the modem type)	£34 (d)

COMPACT
(all on 3½" disc)

ARTROOM	£27 (d)
FONTWISE+	£22 (d)
FONT EDITOR	£22 (d)
RAMROD	£37 (d)
BROM PLUS	£32 (d)
MACROM	£37 (d)
BETABASE	£27 (d)

UTILITIES

ACCELERATOR	£49 (d)
ACORN BASIC EDITOR	£22 (d)
MONITOR (BBC Pub)	£34 (a)
BROM PLUS	£26.50 (d;
SLEUTH	£23 (d)
TOOLKIT PLUS	£31 (d)
TOOLBOX 2 (BBC Pub) Manual / Cassette	£9.50 (d) / £9 (d)
EXMON II	£23 (d)
HELP II	£25 (d)
ACORN GXR GRAPHICS ROM specify B or B+	£22 (d)
PRINTMASTER	£24 (d)
PRINTWISE	£24 (d)
DUMPMASTER supports about 40 printers	£26 (d)
FONTWISE PLUS	£17 (d)
HERSHEY FONT CHARACTER GENERATOR	£18 (d)
ICON MASTER	£29 (d)
MOVIE MAKER Two Roms + Cassette	£26 (d)
ADV TELETEXT UTILITIES ROM	£7.95 (d)

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BBC PUBLICATIONS EDUCATIONAL SOFTWARE

A series of programs developed in many cases alongside Radio & TV programmes by BBC's Education Department which supplement the classroom studies by moving and colourful displays helping in clear understanding of a variety of subjects. Some packages also include audio cassettes.

PRIMARY EDUCATION

ASTRONOMY:
9-12 years. Phases of moon, eclipses, seasons etc. Includes a game. Disc **£11 (d)**

COMPUTERS AT WORK:
The Work Game illustrates two of the most important computer applications: Robotics & IT. Incl. a database prog, word processing tutorial and a robotic control prog. Aud/EC/disc **£16 (c)**

PICTURE CRAFT
An inexhaustible, versatile and flexible suite of programs to design shapes & patterns, paint them and convert them into pictures, puzzles and games. Disc **£17 (d)**

INTRODUCING GEOGRAPHY
9-13 years. Four exciting graphical adventures include river navigation, flying, mountain climbing and desert crossing. Disc **£16 (d)**

MATHS WITH A STORY 1
Four primary level programs incl symmetry, co-ordinates and probability for children of wide ranging abilities. Cass **£8 (d)**

MATHS WITH A STORY 2
Similar programs as 1 but covered from a different angle. Cass **£8 (d)**

NUMBER GAMES:
6 programs designed to stimulate the mind of an active child of 8 years and upward. Cass/EC **£7.50(d)**

USING YOUR COMPUTER
8/12 years. Introduction to computers using synchronised audio techniques. Total of 80mins of audio & 14 progs. Cass **£24 (c)**

WORD PLAY
An elegant but simple introduction to word processing using animal shapes for editing functions. Fun manual for the children. Cass **£10 (d)**

WORD MOVER
A simple text editor. Cass **£8 (d)**

SECONDARY LEARNING

ADVANCED LEVEL STUDIES: STATISTICS
6 progs covering central concepts and principles. Topics include Discrete Data & Binomial Distribution. Eont. Data & Normal Data Distribution. Hypothesis Testing & Confidence intervals, Central Limit theorem & Estimation, Simulations, Correlations and Regressions. Disc **£23 (d)**

ADVANCED STUDIES: GEOGRAPHY
4 progs covering social geography: Traffic & Town planning, drainage & basin management and planning for industry. Cass **£10 (d)**

INSIDE INFORMATION
Designed to introduce IT to young adults. Suitable for use in sec. schools, ITeCs & Adult Educ. Centres. Prog Cass **£10 (d)** Audio Cass **£5 (d)** Book **£8 (d)**

SCIENCE TOPICS (ST)

S.T.: WAVES
A Physics program allows display of waveforms and shows changes caused by different parameters. Disc **£14 (d)**

S.T.: RELATIONSHIPS
A Biology program giving a sophisticated simulation exercise based on data from W.H.O. Disc **£14 (d)**

S.T.: BONDING
A Chemistry program to reinforce & strengthen the concept of bonding of elements. Transfer and sharing of electrons are both shown graphically. Disc **£14 (d)**

S.T.: ELECTROMAGNETIC SPECTRUM
A graphical adventure prog to test your knowledge of the electromagnetic spectrum. Disc **£14 (d)**

S.T.: ELECTRONICS IN ACTION
Program about using computers for control. Control is achieved by using 6502 assy lang. Prog editor is supplied. Disc **£14 (d)**

S.T.: NEWTON & THE SHUTTLE
A interactive prog in 3 parts covering launch to recapture of a satellite to test the knowledge of Newtonian mech. Disc **£19 (d)**

S.T.: ECOLOGY
Simulation program managing a nature reserve to meet a host of individual needs. Disc/EC **£19 (d)**

S.T.: POLYMERS
Students run a manufacturing co. and have to choose best materials for their products and compete with a rival co. run by the computer. Disc/EC **£19 (d)**

S.T.: CLASSIFICATION & PERIODIC TABLE
A database program for producing different classifications of chemical information and presented in any format. Disc **£20 (d)**

S.T.: FOOD & POPULATION
Simulation in space of biological aspects of nutrition and food production logistics. Disc **£20 (d)**

SEC. SCIENCE: MICROTECHNOLOGY
Fundamental concepts of electronics Logic & Resistor Tutors, Servo Cct simulation & a cct design program. Cass **£7 (d)**

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A computer sync. audio program explains definitions of atomic & molecular masses and depicts molar equations. Disc/Aud/EC **£16 (c)**

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Illustrates basic eqns., uniform accln, under gravity and an idea of terminal velocity. Disc/AUD/EC **£16 (d)**

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The popular 'Sight & Sound' touch typing tutor with alterable settings. Disc/EC **£15 (d)**

GENERAL

VU TYPE PROFESSIONAL
An enhanced and expanded version of Vu Type with 63 Pitman approved exercise. Disc **£19 (d)**

WHITE KNIGHT MK II Disc **£16 (d)**
(Specify it for Master).

BATTLEFIELDS Cass **£8.50 (d)**

A VOUS LA FRANCE
A home study aid for anyone learning French. Cass/EC **£17 (d)** Book **£5.25 (d)**

DEUTSCH DIREKT
Disc based vocabulary learning prog with audio cassette to help with pronounciation. Disc/aud/EC **£16 (c)** Book **£5.95 (d)**

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

PRINTER ACCESSORIES

EPSON ACCESSORIES:
Interfaces:
8143 RS232....................£28 (d)
8148 + RS232 + 2K....................£57 (d)
8148 + RS232 + 8K....................£65 (d)
8165 IEEE + Cable....................£65 (d)
8132 Apple II....................£60 (d)
8177P NLQ for FX80 + /FX100 +....................£99 (d)
Parallel & Serial Buffers of various size also available.
FX80/80 + /85 Tractor Attachment....................£27 (c)
LX80/86 Tractor Feed....................£20 (d)
LX800 Tractor Feed....................£44 (b)
LQ1000 Tractor Feed....................£49 (b)
EX800/1000 Colour option....................£55 (b)
H180 HP GL Emulation Rom + Ram....................£59 (c)
H180 Printer Emulation Rom....................£35 (c)

SHEET FEEDERS:
8338 LX80....................£49 (b)
8333 FX100 + /105....................£169 (a)
8331 FX80 + /85....................£129 (b)
8330 RX80 +....................£129 (b)
LQ800....................£129 (b)
LQ1000....................£159 (b)
EX800....................£129 (b)
EX 1000....................£289 (b)
FX 800....................£129 (b)
FX 1000....................£169 (b)

Ribbons:
RX/FX100/100 + . FX105....................£7 (d)
RX/FX80/80 + , FX85....................£4 (d)
LX80....................£4.50 (d)
LQ800....................£8.50 (d)
LQ1000....................£10 (d)
LQ1000....................£10 (d)
EX800/1000....................£7.50 (d)
H180 Pen Set (Aqueous/Ball point)....................£7.50 (d)

Dust Covers:
FX80....................£5.50 (d)
TAXAN/Canon KP810....................£6 (d)
FX100....................£7.50 (d) **KP910 £7 (d)**

HITACHI 672 Plotter
Aqueous Pen Set six pens....................£18.50 (d)
Oil Based Pen Set six pens....................£25.00 (d)

TAXAN CANON Accessories:
RS232 + 2K interface....................£63 (d)
Ribbon. KP 810/815/910/915....................£6 (d)

Star Printer
NL10 Sheet Feeder....................£52 (b)
NL10 RS232 Interface....................£69 (c)
NL10 IBM Type Interface....................£39 (c)
NL10 Ribbon....................£4.50 (d)

National Panasonic KX P1080
Spare Ribbon....................£4.50 (d)
Serial Interface....................£39 (c)

JUKI 6100
RS232 Interfaces....................£65 (d)
Tractor Feed....................£149 (a)
Ribbon (Carbon)....................£2.00 (d)
Spare Daisy Wheel....................£14 (d)
Sheet Feeder....................£182 (a)

BROTHER HR20
Daisy Wheel....................£18 (d)
Tractor Feed....................£116 (a)
Spare Ribbon Nylon....................£3.00 (d)
Spare Ribbon Carbon....................£4.50 (d)

INTEGREX INK JET COLOUR PRINTER
Spare Ink Cartridge Black....................£9 (d)
Spare Ink Cartridge Colour....................£15 (d)
Paper Roll....................£7 (d)

Printer Leads:
BBC Parallel Lead (1.2m)....................£6 (d)
BBC Serial (Epson) Lead (1.2m)....................£7 (d)
Other lengths can be supplied on order:
IBM Parallel Lead (2m)....................£12 (d)

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Plain Fanfold paper with micro perforations:
2000 sheets 91/2" × 11" 60gms/sq m....................£12 (£3)
2000 sheets 141/2" × 11" 60gms/sq m. £18.50 (4.50)
1000 sheets A4 90gms/sq m....................£12 (b)

Labels/1000:
Single Row 3½ × 1 7/16"....................£5.25 (d)
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ACW443 CAMBRIDGE WORKSTATION

A complete self-contained workstation with:.

* NS32016 8MHz Main Processor & 32081 FP processor.
* 20 Mbyte Winchester and one 80T Ds floppy drive.
* A detachable keyboard Hi Res RGB Monitor.
* 4Mbyte of on board Ram as standard.
* Languages supplied include: Fortran 77, Pascal, C, Cambridge LISP, 32016 Assembler & 32bit BASIC.
* Utilities on the operating system to cross link programs between different languages, utilities for porting programs to mainframes.
* **Phone for detailed leaflet.**

32016 CO-PROCESSOR

A second processor that brings genuine 'Mainframe' power to the BBC Computer.

* Interfaces with the BBC through the tube connector.
* NS32016 6MHz CPU & 32081 FP processor.
* 1Mbyte Ram as standard.
* Packaged software includes all the languages and utilities supplied with the ACW Work Station.
* **Phone for detailed leaflet.**

CPU/FP Upgrade Kit (non-Acorn) for the Co Processor for 10Mhz operation to enable faster processing. It can be fitted at no extra charge if ordered with the Co Processor.

TIME WARP Real Time Clock with PANOS utility allows screen display of time, day and date within PANOS at anytime and allows these data to be printed on documents. Model B users will find this particularly useful.

512 CO-PROCESSOR

Brings professional software to the BBC Master.

* 10 Mhz 80186 *DOS PLUS.
* GEM Write & GEM Draw.
* 'WIMP' Environment with high quality Mouse.
* Runs many 'IBM' programs — even 'Flight Simulator'!
* Convert to/from IBM/BBC data.

DOTPRINT PLUS

A uniquely versatile NLQ ROM for the BBC Micro.

* Built-in character font generator.
* Built-in view printer driver.
* Supports microspacing for professional justification in View & with disc in Wordwise/Plus.
* True bold print as well as double width.
* 12 character pitch as standard.
* Fully variable pitch and line spacing.
* Suitable for fully **'EPSON'** compatible printers with quad-density graphics.
* **DOTPRINT PLUS** for EPSON FX/RX and compatibles.
* **DOTPRINT DUAL** for EPSON MX range.

MICROJUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

NORMALLY JUSTIFIED TEXT

homes of a ruling class whose right to rule was based on the ownership of land. Large estates produced money; perhaps even more important, they supplied people to fight for their

Notice how MICROJUSTIFICATION eliminates 'stretched' spaces between words.



For price details see page 1.

Compact

BRITISH BROADCASTING CORPORATION
MASTER SERIES MICROCOMPUTER

THE FAMILY COMPUTER

Now available from stock

This low cost high tech computer has developed specially as a computer for home use.

SPECIFICATION

128K RAM, ADFS Filing system, BBC Basic version 4, MASTER style keyboard, a single 640K 3.5" double sided drive. RGB/Mono Monitor as an optional extra.

Bundled software pack includes:

Desk Top Prog with note pad & calculator, VIEW 3.0, Card Index, & LOGOTRON. A set of exciting games and graphic demos.

Authorised dealer for **"Advanced Interactive Video System"** Please send for details on the equipment and subsidies available to schools

EPSON PRINTERS

EPSON have launched a new series of printers to update the FX range — world's best selling printer range. The new **FX800** and **FX1000** range combines printing versatility and superior technical features with the highest standards of reliability. The features include two NLQ fonts, 10, 12, 17 and 20 cpi, dble ht and dble width, 200 cps in draft and 40 cps NLQ, tractor and friction as standard, IBM compatible, full graphics, 8K buffer, Parallel interface.

EPSON EX800/1000 range offers high speed printing to offer versatility in volume printing with speeds of 300 cps in 12 cpi mode. Four colour printing option is available for these printers.

EPSON LQ800/1000 range with its 24 pin print head offers the highest standards in letter quality printing at high speeds while maintaining the versatility of dot matrix printers. The hex density graphics capability produces about the best printout any dot matrix printer can produce.

STAR NL10

A 80 col 120 cps printer with fine NLQ at 30 cps offers novel and innovative features. There are no dip switches to set, full control from the front console. Plug in interface cartridge simplifies adaptation to different computers. Friction & Tractor feed as standards. Epson Compatible Graphics.

NATIONAL PANASONIC KX P1080

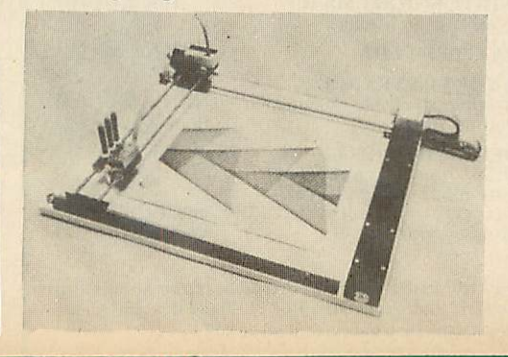
A high performance low cost printer with full character pitch feature 10, 12, 15 & 17 cpi and proportional spacing in both draft and NLQ mode. 80 column, 100 cps draft and 20 cps in NLQ. Parallel interface and Friction and Tractor feeds as standard. Epson Compatible Graphics.

HITACHI 672

* A3 four colour precision plotter.
* Serial and parallel ports as standard.
* Produces 'OHP' transparencies as well as plain paper.
* 'HP' graphics language or single character commands.

GRAPHICS WORKSTATION

A A3 pen plotter with 0.1mm resolution allows graphs, charts, architectural drawings to be plotted using the 9 predefined plotting instructions or by using a CAD package. The pen mount allows a variety of pen types including drawing pens to be used or the following range of accessories to be fitted.



OPTICAL SENSOR

This converts the plotter into a input device and offers a new range of applications: Scan or digitise a picture or a drawing to display or store. Traverse mazes and investigate methods of artificial intelligence. Reliably read bar codes.

DRILL/ROUTER

This will drill holes, machine moulds and cut complex 3-D shapes in a range of suitable materials to a depth of 16mm. Driver software is supplied on disc and an optional application program is available to interface the drill/router to our NOVACAD package.

SCRIBER

The sharp pointed scriber may be used to etch fine line drawings on surfaces such as scraperboard, wax coated copper etc. Full details on request. See page 1 for price.

All accessories available separately if required.

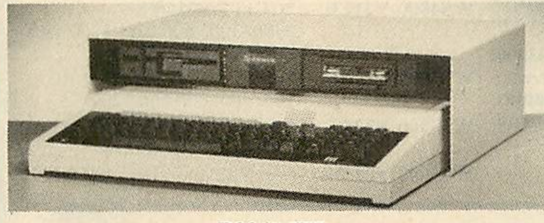





TS 400


PD 800


PD 800 P


P2041 HT

DISC DRIVES

TECHNOMATIC offers a wide range of high quality, high performance drives to meet all needs of BBC micro users. Please see our detailed and competitive price list on page 2.

*All drives are fitted with high quality slim line ultra low power Mitsubishi mechanisms capable of single and double density operation and offering very fast track access and head settling times.

*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*The plinth version drives provide for a neat and compact system installation giving it a more professional look.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with suitably fused 13A moulded plug.

*PD853 Combo drive includes a combination of 5¼" (40/80T switchable) and a 3½" 80 Track Double Sided mechanisms. Complete with mains p.s.u. Ideal for software conversion for 5½" to 3½" or vice versa.

Such is our faith in Mitsubishi mechanisms that we offer a two year warranty on our floppy drives

WINCHESTER DRIVES

Mass storage 20 Mbyte drives are available in the following versions:

* P20HD Stand alone.
* P204HP With a single floppy housed in a plinth version case.
* P214TS Top of the range with a 10 Mbyte back up streamer and a single floppy housed in a plinth type casing and supplied with backup utilities.
* TS10 A stand alone 10Mbyte streamer for those who are already equipped with a Winchester and a floppy drive. Utilities for backup can only be loaded from a floppy.

All models are fully compatible with Acorn's ADFS system and include a mains psu and the necessary cable connections.

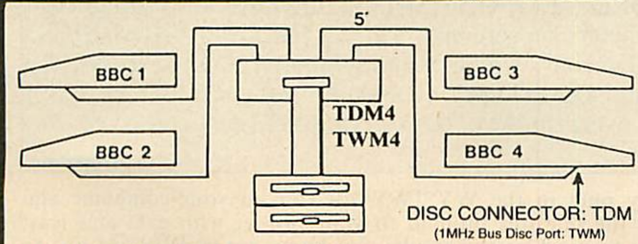
ALL TECHNOMATIC DRIVES NOW CARRY A TWO YEAR WARRANTY

FLOPPICLENE
Disc Drive Cleaning Kit

Floppiclene introduces a positive concept in ensuring continuous high performance of the disc drives by providing an easy and efficient method of keeping the drive heads clean. Use of disposable cleaning discs eliminates the risk always present in reuseable discs of recontamination and abrasion of the sensitive drive heads. Available for both 5.25" and 3.5" drives. Please see page 2 for prices.

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



TDM4/TWM4 Quad Unit (up to 4 computers)
TDM2/TWM2 Dual Unit (2 computers)

WINCHESTER DRIVE MULTIPLEXER

A unique addition to our hardware range that allows the sharing of a Winchester between a number of computers. The principle of operation is the same as our highly popular disc drive multiplexers and there is no need for any additional software or hardware modifications. The Multiplexers are available in two versions, a dual unit for two computers and a quad unit for four computers to share a Winchester. Multiplexers are particularly useful for accessing common software and transferring data between the computers. (Not recommended for use with randon access files).

LEADING SUPPLIER TO BBC MARKET ESTABLISHED OVER 15 YEARS

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BBC COMPUTERS & ECONET CENTRE

17 Burnley Road, London NW10 1ED Tel: 01-208 1177

305 Edgware Road, London W2 Tel: 01-723 0233

MODEMS

MIRACLE WS4000

* A cost effective intelligent modem that offers the best value for money bringing the world of data communication within easy reach.
* Plain English commands make it simple to use, even for the first time user.
* Latest Hayes-type protocol commands, auto dial, auto answer, auto speed seeking.
* Equalisation model in V23 for line-noise filtering.
* Many other options including upgrading to V22 and V22 bis.

MIRACLE WS2000

* A comprehensive manually switched 'World Standard' modem.
* Competitively price with a capability to be upgraded for various options.
* BT approved for V21/V23, 300/300, 1200/75 and 1200/1200 half duplex.
* Includes BEL103/113/108 standards for use outside UK.

Optional extras include (Not BT approved).
* SK1 chip set for computer control.
* User port cable.
* Auto dial Board.
* Auto Answer Board.
* DS1 disc for auto dial facilities on Commstar.



WS 3000 Range

Miracle have introduced two new models in the WS3000 series for users who require a modem for a specific use. Model WS3022 provides 1200/1200 baud full duplex operation whilst only WS3024 provides 2400/2400 baud fd only.

Please see page 2 for prices

MIRACLE WS3000 RANGE

* A professional range of intelligent modems with full BABT approval.
* Auto Answer and Auto Dial facilities installed as standard.
* HAYES protocols implemented.
* Pulse or DTMF 'tone' dialing.
* Plain English command structure simplifies the use of the modem.
* Integral parallel printer port fitted as standard configurable for both input and output for process control applications.
* A line sharing facility to differential between data and voice calls.
* Intelligent speed buffering converts 1200/1200 terminals to 1200/75
* Equalisation mode for line noise filtering.
* Internal battery back up for storing 63 names, numbers and default settings.
* Upgrade path for 1200/1200 and 2400/2400 and security encryption.
* Applications in the field of graphics and text access, high speed telex, user to user, and user to main frame.

SPECIFICATIONS

WS4000 V2123:	*CCITT V21/V23. *300/300, 600 and 1200 half duplex, 1200/75.
WS3000 V2123:	*CCITT V21/V23/Bell 103. 300/300, 600 and 1200/75
WS3000 V22:	*As V2123 and also 1200/1200 full duplex.
WS3000 V22 bis:	*As V22 and also 2400/2400.

MULTIFORM Z80

A unique Z80 2nd Processor with a 'MULTI FORMAT' capability.



* Multiform Z80 will run most CP/M 2.2 formats on the BBC.
* 28 different formats including Acorn Z80, RML 380Z & 480Z, EPSON QX, Amstrad, Osborne etc, supplied on the library disc with the utility to create additional formats.
* Emulates the two of the most commonly used CP/M terminals, HAZELTINE 1500 and ADM-3a in addition to the Acorn VDU making installation of most of the software packages easy.
* Utility to inter convert ASCII text wordprocessed on a standard BBC and under OS/M or CP/M.
* 8271 allows single density CP/M formats whilst 1770 DFS allows both single and double density CP/M formats. Single or dual drive, 40 or 80 track format and SS or DS drives can be used providing the CP/M format matches.
* Dual drive will allow two separate formats to operate simultaneously for data transfer making it ideal for use in environment where machines with different formats are in use.
* Utility to read and write on IBM PC DOS discs available as an optional extra. Utility will also format a PC DOS disc.
* Multiform Z80 is supplied with a OS/M operating system rom, System disc and a Library disc. Please specify the DFS type and the drive format when ordering.

WYSIWYG PLUS



This new screen/printer utility not only allows you to see on the screen exactly how the text is going to appear on the paper when printed but also simplifies the printer control codes that you need to use to get the different effects.

WYSIWYG + can be used in BASIC or from within most popular word processors like View, Interword & Wordwise Plus.

The printer commands have been simplified to meaningful words so that the user does not have to either remember or keep referring to the printer manual and try to decode the commands to VDU format. For example: *ENGLARGED will display enlarged text on the screen and send the appropriate command to the printer to print in enlarged mode.

Some of the features you could see in WW + or from BASIC include:
*SUBSCRIPT, *SUPERSCRIPT, *ENLARGED, *BOLD, *EMPHASISED, *CONDENSED (up to 132 characters on screen), *PICA, *ELITE, *GRAPHICS (design your own logos and symbols), *UK, *FRENCH, *US, *TELETEXT (character sets), *BACKSPACE (for overprinting), *DOWNLOAD (new characters or fonts).

Simply plug in the WYSIWYG+ rom in your computer and utilise the features built in to your printer with ease and least bother to produce the results you know are possible but not so simple to achieve. No other single package offers this much flexibility and simplicity to get the best from your printer.

WYSIWYG+ rom is supplied with a comprehensive manual.

TECHNOLINE
(24 hr viewdata system)
Tel: 01-450 9764

MAIL ORDER
7 Burnley Road
London NW10 1ED
Telex: 922800

RETAIL SHOPS
15 Burnley Road, London NW10 1ED
Tel: 01-208 1177 Telex: 922800
(close to Dollis Hill ⊖)

West End Branch
305 Edgware Road, London W2
Tel: 01-723 0233
(near Edgware Road ⊖)

For fast delivery telephone
your order on 01-208 1177
using VISA/Access Card



Orders welcome from
government depts &
educational establishments.

All prices ex VAT.
Prices are subject
to change without notice.

Please add carriage
(a) £8.00 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

EPROMER III
Eprom Programmer

An enhanced version of the highly successful EPROMER II providing added sophistication to the eprom programming applications on the BBC computer range. The new software also utilises the extra facilities of the BBC Master computer. The programming methods are 'state of the art' of programming technology for fast, efficient and cost effective operation.

The single rail eproms handled by the EPROMER III are:

- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA

The software is menu driven, many operations being single key. On screen help clarifying the operation being carried out. Will make the programming process very simple and easy for both specialists and novices alike.

The main features of the programming software are:

* Device, function and voltage selection from the computer keyboard.
* Continuous display of the options selected.
* All eproms upto 27512 (64K) programmed in single pass.
* Automatic Intelligent identifier support for eproms able to respond.
* Selectable programming voltage 25/21/12.5V
* 3 programming methods: Normal, Intelligent & Pulse (20 sec for a 27128).
* Serial port protocols supported.
* Intel HEX, Motorola S, HEX and ASCII protocols supported.
* DFS, NFS, ADFS and Rom Filing System Supported.
* BASIC/Machine Code programming using RFS.
* Powerful editor with input in HEX or ASCII. * Full editable 64K file.
* Block move of data within the address range.
* User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
* Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EPROMER III interfaces with the BBC through the 1 MHz bus, has a mains power supply and is fitted with a 3M TEXTOOL ZIF socket to provide consistent and reliable service for a long period.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach." **Acorn User October 1986**

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 128 (2716, 2732, 2764, 27128):
PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

MICROPROMER

An add on unit for Epromer II enabling the user to program 8741, 8748 and 8749 single chip microcontrollers. Now with the aid of cross assemblers such as META, the user can write code for the above devices and then with the aid of Micropromer program the device.

* Simple menu structure with on screen help. i.e. select a function and on the screen will appear details of the function being performed.
* Comprehensive error reporting and checking.
* Read, verify, blank check, program from 1 to the maximum byte count for the device being used at any address location.
* Support for DFS, ADFS and cassette filing systems.
* Edit data in Hex or ASCII.
* Total control via software, no switches to worry about.
* Supplied with user manual and software on diskette.
* MPROMER simply plugs into the EPROMER II ZIF socket.

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc): updates soon for most of Meta processors.

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

BOOKS

No VAT Carriage Code (c)

LANGUAGES
6502 Assy Lang Prog............£19.95
6502 Programming..............£13.95
8086 Book..........................£23.95
Acorn BCPL User Guide.......£15.00
Acorn FORTH......................£7.50
Acorn LISP.........................£7.50
Acorn ISO Pascal Ref Manual.£10.00
Intro to COMAL..................£10.00
Intro to LOGO......................£7.50
Micro Prolog Ref Manual.......£10.00
Introduction to Turbo Pascal..£14.95
Prog the Micro with Pascal.......£8.50
The UNIX Book......................£7.50
Unix User Guide..................£19.95
Understanding Unix.............£18.45

BBC MICRO GUIDE BOOKS
BBC User Guide Acorn..........£15.00
BBC Plus User Guide............£15.00
Drawing your Own BBC Programs.............................£6.95
Inside Information.................£8.95
Math Prog in BBC Basic.........£7.95
Toolbox 2...........................£10.95
VIA 6522 Book......................£4.50

PROGRAMMING/UTILITY
Advanced Sidewise Ram User Guide £9.95
Advanced User Guide (BBC)...£15.95
Advanced User Guide............£12.50
Applied Ass./Lang on the BBC.£9.95
BBC Micro Sideways ROM's RAM's £9.95
Guide to the BBC ROM...........£9.95
Beginners Guide to W.P..........£7.95
View 3.0 User Guide.............£10.00
Viewstore..........................£10.00
Viewsheet..........................£10.00
Wordwise Plus......................£9.95

SOUND & GRAPHICS:
Mastering Music...................£6.95

DISC DRIVE SYSTEMS:
Advanced Disc User Guide.....£16.95
Disc Book............................£3.50
Disc Programming Techniques..£7.95
Disc Systems........................£6.95
File Handling on the BBC........£6.95
Discovering Disc Drives..........£POA

APPLICATIONS:
Interfacing Proj for BBC.........£6.95
BBC and Small Business..........£5.75

PROFESSIONAL SOFTWARE
Wordstar made easy.............£16.95
Introduction to Wordstar.......£17.95
Wordstar Handbook.............£11.95
dBase-II for the first time user.£16.95
Understanding dBase-III........£22.95
Multiplan Made Easy...........£18.95
Multimate Complete Guide.....£16.95
ABC of LOTUS 123.............£17.45
1-2-3 for Business................£16.95
Adv Tech in dBase II/III........£22.95
Mastering CP/M..................£17.95
CP/M Bible........................£16.50
Introducing CP/M on BBC & Z80...............................£9.95
MS/PC DOS Prompt............£10.95

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NOVACAD

Computer Aided Draughting for the BBC Micro

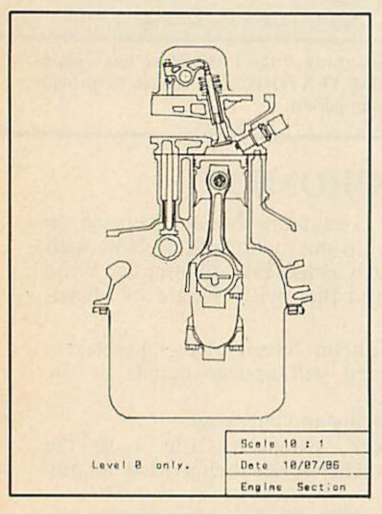
NOVACAD II for the BBC Master
Please ask for a leaflet

"The Novacad system is a thoughtfully designed piece of software requiring a minimum of manual bashing so that real results are possible with just a few hours work."

"Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market"." **A&B Computing August 1986**

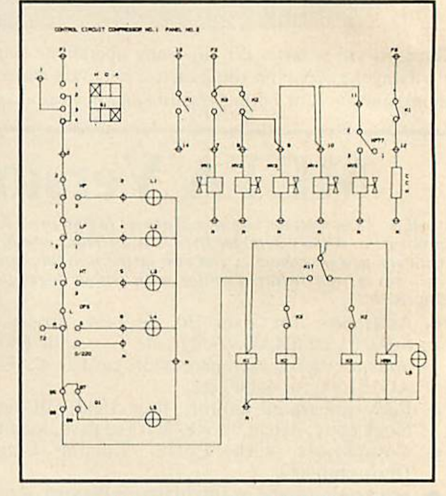
A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.



The major features of NOVACAD are:

* Simple and easy to use with logical command sequence.
* A large drawing area (approx 15 screens).
* The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
* A zoom facility allowing magnification of up to 20 times to insert finer details.
* Block copy of shapes on the screen for repetitive use.
* Text entry at any 90° orientation at any position on the screen.
* Create multi layer drawing with 8 levels available.
* Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
* Printer routine for Epson 80 and 136 column printers.
* A unique facility to output to any BBC compatible plotter.



MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC+ or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

NOVACAD

is available in two versions

*BASIC version for cursor control from the keyboard.

*T/M version for cursor control from the keyboard. Tracker Ball or a Mouse.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Preconfigured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

ROUTCAD, an optional software package for our Graphics Workstation allows for production of shapes drawn using NOVACAD in 3D on suitable material and is ideal for a range of applications including template making and model building.

NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.



WINDOMATIC



All users of Acorn's VIEWSHEET spreadsheet program will be aware of its powerful windowing facility which allows the screen and/or printer to be configured in upto 10 separate windows taken from anywhere in the sheet. They will also be painfully aware of how difficult and time consuming it is to set up a required display. Although VIEWSHEET allows configurations to be saved to the media, it does not have provision for deciphering them.

WINDOWMATIC has been produced with the intention of recitifying these shortcomings and to bring out the very best from VIEWSHEET.

WINDOMATIC provides a quick and easy way to configure screen and printer allowing complicated documents and reports to be set up much more easily. It displays complete text information on all 20 windows and accurate graphic representation of the screen and printer output.
The package includes a screen dump routine for Epson printers and allows use of other printer dump packages.
The program is compatible with BBC Master, B+ and 6502 and Turbo second processors. It can be entered from VIEWSHEET by use of function keys or it may be run by loading a previously saved window configuration from disc.
The program is supplied on a disc with a comprehensive manual.

HINTS & TIPS

Martin Phillips delves into databases, solves a printer buffer problem and explores Master printer drivers

CHOOSING AND USING A DATABASE

There are many databases for the BBC family of computers, and I suspect that many readers have at least one in their collection of software. There must also be a large number of readers who have tried to create a database, but have met with little success. So let's see how you can get the best from a database.

First you must decide why you need a database. This might seem obvious, but it's often the point at which mistakes are made. An answer such as 'to keep a record of my stamp collection' is not enough. You must then ask *why* you want a record of your stamp collection, and how a database is going to help. If you just want a list of all the stamps, then a wordprocessor or good old paper and pencil are better bets.

A database has a different function. It allows individual items to be identified by asking a series of questions. Thus a database could be used with a large stamp collection if you want to be able to find particular stamps quickly. You could construct a database to find answers to such questions as:

- Which are the most expensive stamps?
- Which stamps feature birds?
- Which British commemorative stamps were issued in 1983?
- What is the commonest colour?
- Which stamps feature a royal family?
- What percentage of the stamp collection is British?

Answering questions like these is very different from just providing a list of stamps in a catalogue and if you don't need to know such things then you probably don't need a database. A simple list on a wordprocessor would be better.

Another use for a database is to provide information to link in to another system, such as a wordprocessor, so that tables and charts can be included quickly. Maybe you want to put a whole series of names and addresses onto a database and then use a label printing facility. Such applications need choosing with care.

If you have, say, less than 50 addresses, then such a feature is perhaps not the most efficient. If you have many more, then keeping track of them on the database can become difficult too.



ILLUSTRATIONS BY IAN DICKS

Once you've determined the sort of questions you would like to ask of the database, you could then go on to consider how the collection is put together. For example, many stamp albums go country by country. If you have a database record of all your stamps, this gives a tremendous flexibility in the way they are stored. So long as each stamp has a catalogue number, with a database it is possible to locate it easily, and you are then free to store them in any way you want.

Types of database

When you've decided that a database is actually worth the effort, you must then consider the structure of the data file. To a large extent this will depend on the type of questions that will be asked of it. You must also consider the particular limitations of the database package to be used. If this poses too many limitations, then look for a different database. There are two important types available:

- All the data is loaded into the machine before starting.
- The data is stored on disc and when a search is made, parts are loaded in a part at a time and displayed as required.

The first type is very fast in operation and is suitable for tape machines. This type tends to be very limited in application, because there is not very much room for storing the records and for sophisticated programming. You are often limited to about 10k to 15k of information, which is not very much.

The second type is by far the most common, and can store quite large amounts of data, limited only by disc size (from 100k for a 40-track disc drive, to 640k using an 80-track double-sided disc drive with ADFS). This system is much slower in operation, partly because of the longer file length that's possible and partly because the records have to be loaded in from disc in parts. But an advantage of this system is that well-constructed versions are very robust – that is, they are less likely to allow the accidental loss of data. When a new record is created with this type of database, the record is often saved to disc immediately. Thus there is less chance of data being lost through forgetting to save it, or through some accident like pressing the Break key.

Some databases are supplied on tape, some on disc, and some on ROM. The first field in a data file is usually the name, either the name of an object or person or some other unique identifier such as a catalogue number. This field is then often called the key field, as without it the rest of the data in that record is meaningless.

One should also consider the final screen

presentation. It is obviously useful to be able to contain all the information for a single record on the screen at the same time. Therefore using, say, 40 very short fields is perhaps not the most effective way of doing this.

You should look at how your file is to be organised. It might be that using the database will allow you to reorganise your stamp collection in a more effective way. Consider how you would uniquely identify any stamp, either in the collection, or on the datafile.

I often code information. If we go back to our stamp collection once again, we could have one field called 'description'. Rather than a long text description of the stamp, we could simply include a series of codes, for example:

Colour	red	code CR
	yellow	code CY
	mauve	code CM
	blue	code CB
Size	small	code SS
	medium	code SM
	large	code SL
Picture	birds	code PB
	animals	code PA
	queen	code PQ
	president	code PP

Such a coding system is very easy to set up. You can use two or more letters, and group them as I have done above. Then you will need to keep a list of these codes with the file. I print out a list in condensed type and stick it on the back of the disc sleeve. You can add new codes as and when they are required, and you should leave space for several codes to be included in one field.

Thus a stamp in our stamp collection might have the following description:

DESCRIPTION: CR,CM,SM,PB

This would indicate that the stamp was red and mauve, was one of medium size and depicted birds. Once you are familiar with this sort of system, it can save a great deal of typing.

Having designed the structure for a file, do a check to see if there is any information which you will need, but which will not fit into your structure. Once you are happy with the structure, then check whether you will be putting information into the file that will be of no use.

Getting going

This is where the most mistakes are made. The secret here is to take just a few records and put them into your data file. Now do the following checks:

- How easy are they to put in?
- How well protected is the database: can you make mistakes and lose information?
- Can you ask all the questions you had identified earlier?
- Do you get the answers you expected?
- Does the data file link to the word-processor or the label printer, and how easy is it?
- How long does it take to put a single record in? How long therefore will it take to put the whole file in?
- How many records will you be able to store? A rough rule of thumb is that the file size equals the number of records times the record length. The record length is the sum of the lengths plus four of each of the fields in the record. The four extra characters for each field allow for end of text markers and so on.

I suspect that few people trying this exercise will not have to go back to the drawing board. I know I always have to. Sometimes I know that I need another database to do the job efficiently, sometimes I need to rethink the structure and amount of data I am going to put in. Sometimes I decide that perhaps the database was not the best means of storage after all. Nevertheless, time spent in designing and testing a data file is time which will be well rewarded.

JARGON BOX

Alphanumeric character A character which can be a letter, number or a special character.
Database system A system for storing, retrieving and manipulating information. This is a type of computer program, often used in business.
Data disc A disc with one or more data files stored on it.
File A structured collection of records, sometimes called a database. This is equivalent to for example, a full card index file.
Field A specific piece of information in one record. This is equivalent to a heading on a record card.
Fieldname The heading or title of a field in a database.
Filename The name of the file.
Numeric character A character which is a number.
Record The information about one entry in a file. This is equivalent to a single record card in a card index file.
Search Looking through a database file for a specific sequence of words or numbers.

Maintaining a data file

Having set up a data file and found that it will do what is required of it, then you can start entering data. At this point you must remember that all the effort put in can be so easily lost. *Always keep copies of your data files.* It is obvious but it is easy to forget. The best way of all is to keep three copies. This is sometimes called the son, father and grandfather system, but I find that this method of labelling does not help much. I keep three copies, label the discs one, two and three, and keep a card inside each disc sleeve noting the last time that particular disc was updated.

Then after I have finished working on disc one I back it up onto disc two. The next day I use disc two and back it up onto disc three, then on to disc one again.

This way I never lose all my information, and I always know which is the most up-to-date disc.

£5

SENDING CHARACTERS TO THE PRINTER

In December's Hints and Tips, we published a plea for help from Mark de Weger. His problem was that sending codes to the printer buffer using *FX138,3,. . . had no effect. Mr D L Harper from Nottingham wins himself £5 for the most complete solution.

He has pointed out that sending characters to the printer buffer is not enough. The printer generates an interrupt to indicate that it has received a character. The operating system then looks at the printer buffer and if it is not empty it sends the next character.

This means that in addition to sending characters to the buffer, it is necessary to do two things first: enable the printer interrupt, and actually send the first character to the printer. If these two things are not done, even though the interrupts are enabled, no interrupt will be generated.

Once one character has been sent to the printer, the operating system will take over and continue sending characters until the printer buffer is empty, at which point the interrupts will be disabled. Listing 1 (on page 47) will do this for a parallel printer.

What happens is that the first character is extracted from the buffer (lines 190-210), the

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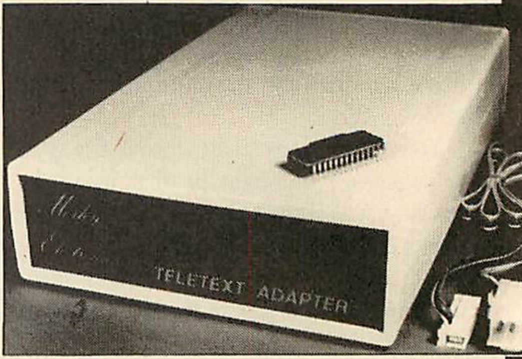
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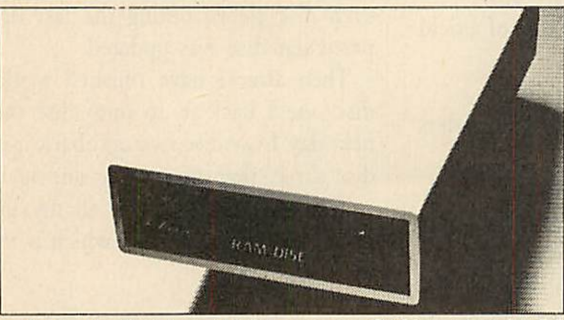
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The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS).

The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive no. is 4.

'Dangerous' * commands such as *COMPACT, *COPY, *BACKUP etc are intercepted and the BBC's RAM from page 2 to &7FFF is saved to RAMdisc workspace, and may be recovered using a * command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The save operation delays the * command by just under 0.4 seconds. The BBC's RAM can also be saved by an interrupt-driven routine which can be enabled by a * command.

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printer interrupt is enabled (lines 250 to 260), the character is written to the output register of the user VIA (line 270) and the printer is informed through the 'handshake' line.

Note that the printer buffer will need to be kept topped up after this. If it empties then code% will need to be called again.

Mr Harper points out that it was incorrect to assume that if 100 characters are sent to

```
   10 REM LISTING 1
   20 REM HINTS & TIPS
   30 REM By D L Harper
   40 REM For all machi
nes
   50 REM (c) Acorn Use
r  March 1987
   60 :
   70 PROCassemble
   80 FOR N=1 TO 60
   90 *FX138,3,65
  100 NEXT
  110 CALL code%
  120 END
  130 :
  140 DEF PROCassemble
  150 DIM code% 50
  160 FOR pass%=0 TO 2
 STEP 2
  170 P%=code%
  180 [OPT pass%
  190 LDX #3
  200 CLV
  210 JSR !&22C
  220 BCS exit
  230 PHP
  240 SEI
  250 LDX #&82
  260 STX &FE6E
  270 STY &FE61
  280 LDA #&C
  290 STA &FE6C
  300 LDA #&E
  310 STA &FE6C
  320 PLP
  330 .exit
  340 RTS
  350 ]
  360 NEXT pass%
  370 ENDPROC
```

the printer buffer, all 100 will be printed out. Even with this routine, if the printer buffer overflows, then the extra characters will be lost. Therefore before sending characters to the buffer, a check should be made that the buffer has free spaces available.

QUICK FIRE CORNER

Using *BUILD on a Master, you can put control codes into !BOOT, using eg, N for Ctrol-N and so on.

PRINTER DRIVERS ON THE COMPACT. . .

When *View* is entered from the front panel on the Master Compact's Welcome disc, it automatically loads the printer driver Epson. What the manual does not say is that on the Welcome disc there are several other drivers. Once in *View*, from the command screen type in the following:

*DIR $.DRIVERS

To see which drivers are in fact provided type in:

*.

The following printer drivers are supplied:

FAC2	FLO16
FX4	JP101
JUKI4	

To load one of these drivers enter:

PRINTER JUKI4

and the command screen will now show the new driver which is installed.

Welcome discs. It is interesting to note that early versions of the Welcome disc do not have these drivers. To find out whether yours has, enter ADFS and catalogue the disc. There should be a directory on the disc called PRINTDRIVE. You can tell it is a directory because it is followed by DLR. To see which drivers are on the disc, now type in the following line:

*DIR PRINTDRIVE

and catalogue the disc. The following drivers are supplied:

EpsonFX14
Juki4
Flow16

These can then be loaded in from the Welcome disc from the command screen of *View* by typing:

*DIR PRINTDRIVE
PRINTER EPSONFX4

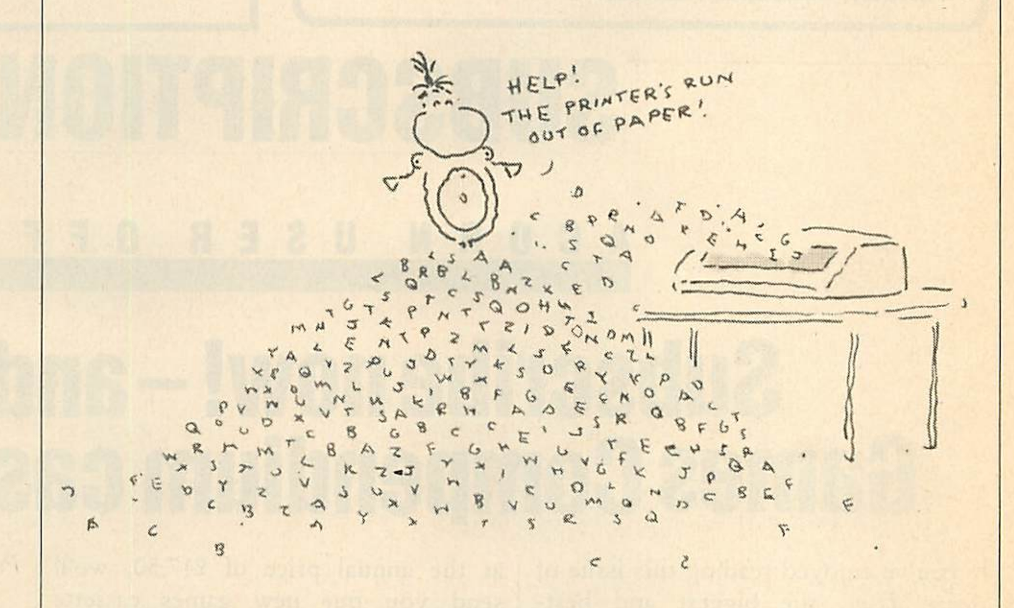
It is a little annoying to have to go through this routine each time, especially if you normally use the disc filing system and not the advanced disc filing system. These drivers can easily be transferred to the DFS. Starting from the DFS, put the Welcome disc in the disc drive. Enter the following lines:

*ADFS
*DIR
*LOAD PRINTDRIVE.EPSONFX4
*DISC

and put a DFS disc in the disc drive. Then type in:

*SAVE EPSON 400 +100

The printer driver will now have been transferred, in this case called EPSON. You can then build a !BOOT file to automatically select *View* and load the printer driver.



. . . AND ON THE MASTER

It says in the *View* manual that *View* contains a 'default' printer driver program which automatically operates unless you load a special driver.

On the Master, no printer driver appears to be in operation, and you cannot get emphasised print or underlining using the appropriate *View* highlights.

To get emphasised printing or underlining, special printer drivers have to be loaded in. There are some printer drivers on some

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FIRST BYTE

FLAGS OF CONVENIENCE

More on machine code: this month we introduce the Status Register and examine what the flags in it do

[redacted]

Tessie Revivis

Readers have been writing in to say positive things about First Byte's informal series on machine code programming, which is very gratifying. Others have commented that some topics are easy to follow while some are simply beyond them. The answer is perseverance. The problem with learning any new language is that quite often you can't grasp one aspect properly until you understand others. It's rather like being given a big jigsaw without the lid! So if things remain puzzling, come back to them after a rest and try again: eventually it will click. I had the same problems in days gone by.

Our attention this month is focused on the subject of flags, which was introduced in the last issue. Flags are devices which can have one of two states, namely true or false. The 6502 microprocessor has built into it a special flags register, called the Status Register. By reading its contents after certain operations the program can make certain decisions and act accordingly.

7	6	5	4	3	2	1	0
N	V	—	B	D	I	Z	C

Figure 1. The Status Register's eight bits

The Status Register occupies a single byte of memory though it does not form part of the micro's memory map, as it is in the actual 6502 chip. As we know a byte can be broken down into eight bits and each bit can have one of two states, ie, a bit can contain a one or a zero and this is used as the flag.

The zero flag is just one of the seven bits used in the Status Register (the eighth bit isn't used). As we saw in last month's First Byte, the zero flag is set when an operation results in a zero. For example the following command:

LDA#0

will place a one into the zero flag. On the other hand the following instruction:

LDX#45

would cause a zero to be placed into the zero flag. Register loading operations are just one way the zero flag can be set: an addition or subtraction which gives an answer of zero will set the zero flag. This can be thought of in Basic like this:

IF A%=0 THEN zeroflag=1 ELSE zeroflag=0

```
   10 REM Testing the
Status Register
   20 REM First Byte M
arch 1987
   30 :
   40 DIM code% 50
   50 P%=code%
   60 [
   70 LDA #0
   80 PHP
   90 LDA #1
  100 PHP
  110 SEC
  120 PHP
  130 CLC
  140 PHP
  150 :
  160 PLA
  170 STA &70
  180 PLA
  190 STA &71
  200 PLA
  210 STA &72
  220 PLA
  230 STA &73
  240 RTS
  250 ]
  260 CALL code%
  270 :
  280 lda0%=?&73 AND &
2
  290 lda1%=?&72 AND &
2
  300 sec%=?&71 AND &1
  310 clc%=?&70 AND &1
  320 PRINT lda0%,lda1
%,sec%,clc%
```

Listing 1. Tests the current Status Register

We have already met another Status Register flag and this is used by the carry bit during an addition and/or a subtraction – it is called the Carry Flag.

Figure 1 shows how the Status Register is arranged. The carry flag (C) is bit zero, and the zero (Z) flag is bit one. To see that these bits really do work, enter and run listing 1.

The listing is straightforward and introduces a new instruction. We have already encountered the stack and the command PLA which takes the top item on the stack

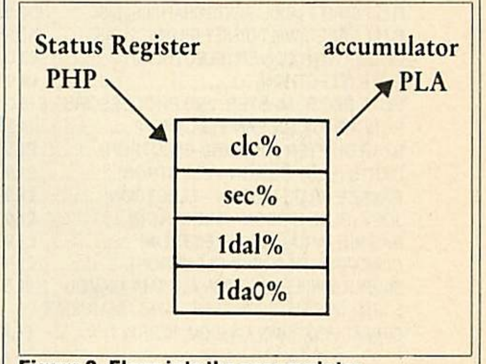


Figure 2. Flags into the accumulator

and places it into the accumulator. PHP is the 'PusH Processor' instruction, a misleading mnemonic, but what it actually does is to take a copy of the Status Register and deposit it onto the top of the hardware stack. So by combining the two instructions we can read the current state of the Status Register into the accumulator as illustrated in figure 2.

The Status Register is pushed onto the stack after a flag setting operation and subsequently pulled and stored in a zero page memory location via the accumulator. At the end of this the results are logically ANDed to preserve the carry flag bit or the zero flag bit before the results are printed out.

Compare them with the action you would expect, to satisfy yourself that the result is indeed what it should be. Try rearranging the instructions and substitut-

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ing your own small sections of assembler to see what the end result is.

Referring back to figure 1, the name for each of the flags that we have not so far covered are as follows:

N – the negative flag
V – He overflow flag
B – the break flag
D – the decimal flag
I – the interrupt flag

Negative flag

The last four flags, B, D, I and V, are for more advanced users so we will pass them by for the moment, however the N flag is easily understood.

The negative (N) flag works in a very similar fashion to the zero flag. In this case though, it is set whenever an operation results in a negative. Remember a negative number in machine code terms is one which has the most significant bit (bit seven) set. In reality it means when the result is in the range &80 to &FF. In Basic the negative flag would be set as follows:

If result%>=&80 THEN negflag=1 ELSE negflag=0

Thus the operation:

LDA #&FF or LDX #&80

or similar operations would set the negative flag. Just as it is possible to test for the setting of the zero flag with a BEQ ('Branch if EQual'), there is an operation

```
   10 REM Using the Ne
gative Flag
   20 REM First Byte M
arch 1987
   30 :
   40 DIM code% 50
   50 FOR pass=0 TO 3
STEP 3
   60 P%=code%
   70 [
   80 LDX #&80
   90 LDA #ASC"*"
  100 .loop
  110 JSR &FFEE
  120 INX
  130 BMI loop
  140 RTS
  150 ] NEXT
  160 CALL code%
```

Listing 2. Tests the negative flag

to test for the setting of the negative flag. The instruction is BMI which stands for Branch if MInus. Listing 2 puts this instruction to use to print 128 asterisks.

The X register is used as a counter to count from &80 to &FF. While the X register retains a value in this range a BMI branch will always succeed. However, when X holds &FF and is incremented to &00 the BMI will fail and so the program will complete. Of course when BMI fails because X holds zero, the zero flag will have been set.

Branch if plus

To complement the BMI instruction there is a BPL or 'Branch if Plus'. The instruction will only cause a branch when the negative flag contains zero. This occurs when the result of an operation is a positive value, ie, in the range zero to &7F.

```
   10 REM Using the BP
L Instruction
   20 REM First Byte M
arch 1987
   30 :
   40 DIM code% 50
   50 FOR pass=0 TO 3
STEP 3
   60 P%=code%
   70 [
   80 LDX #&20
   90 .loop
  100 TXA
  110 JSR &FFEE
  120 INX
  130 BPL loop
  140 RTS
  150 ] NEXT
  160 CALL code%
```

Listing 3. 'Branch if plus'

Listing 3 uses this to print out the ASCII character set which has code numbers in the range &20 to &7F. When the X register moves from &7F to &80 the negative flag is set and the BPL will not take place.

Transfer trail

The stack example given earlier in listing 1 shows how the stack can be used to move data from the Status Register into the accumulator with just two instructions:

PHP – Push processor Status Register
PLA – Pull the top of the stack into accumulator

By reversing the roles of the instructions it is possible to move an item of data from the stack and into the accumulator thus,

PHA – Push accumulator onto stack
PLP – Pull the top of the stack into Status Register

Moving data between the accumulator and index register is also made easy by a set of transfer instructions made for the top. Data can be transferred in two directions, namely from the accumulator and to the accumulator. There are four instructions in all:

TAY – Transfer Accumulator to Y register
TAX – Transfer Accumulator to X register
TYA – Transfer Y to Accumulator
TXA – Transfer X to Accumulator

The instructions can form a quick way of clearing the three registers, simply by loading one with zero and then transferring it to each in turn:

LDA #0
TAX
TAY

Master codes

If you own a Master 128 or Master Compact then your micro has a more advanced form of the 6502 microprocessor in it. In fact it's a 65SC12, to give it its full name. To all intents and purposes this version of the chip acts exactly like the standard 6502 chip. However it has a few extra instructions in it that can make transferring of data an easier task. On a normal 6502 if we wish to push all three registers onto the stack it is necessary to move them via the accumulator, ie:

PHA – Push accumulator
TYP – Move Y into accumulator
PHA – Push accumulator
TXA – Move X into accumulator
PHA – Push Accumulator

And of course if we wish to move them back the reverse process must be done. The 65SC12 however has instructions that allow index registers to be pushed onto and pulled directly from the stack. The new instructions are:

PHX – Push X register onto the stack
PHY – Push Y register onto the stack
PLX – Pull stack into X register
PLY – Pull stack into Y register

These new instructions (and there are others) are supported by the Master assembler so you can use them. But they will not work on a normal BBC, so if your program must work on both, stick to the standard 6502 instruction set .

Remember, if you are finding the articles difficult, keep trying and persevere until you understand.

Next month we'll have a look at sideways RAM.

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ACORN FORUM

Mice, trackerballs, sprite generation and background colours are assessed by Mike Barwise in this month's Acorn Forum

OF MICE AND MICROS

A lot of interest has been shown over the last few years in methods of enhancing user friendliness. The latest technique to reach the home micro is icon-driving and the latest gadget, the mouse.

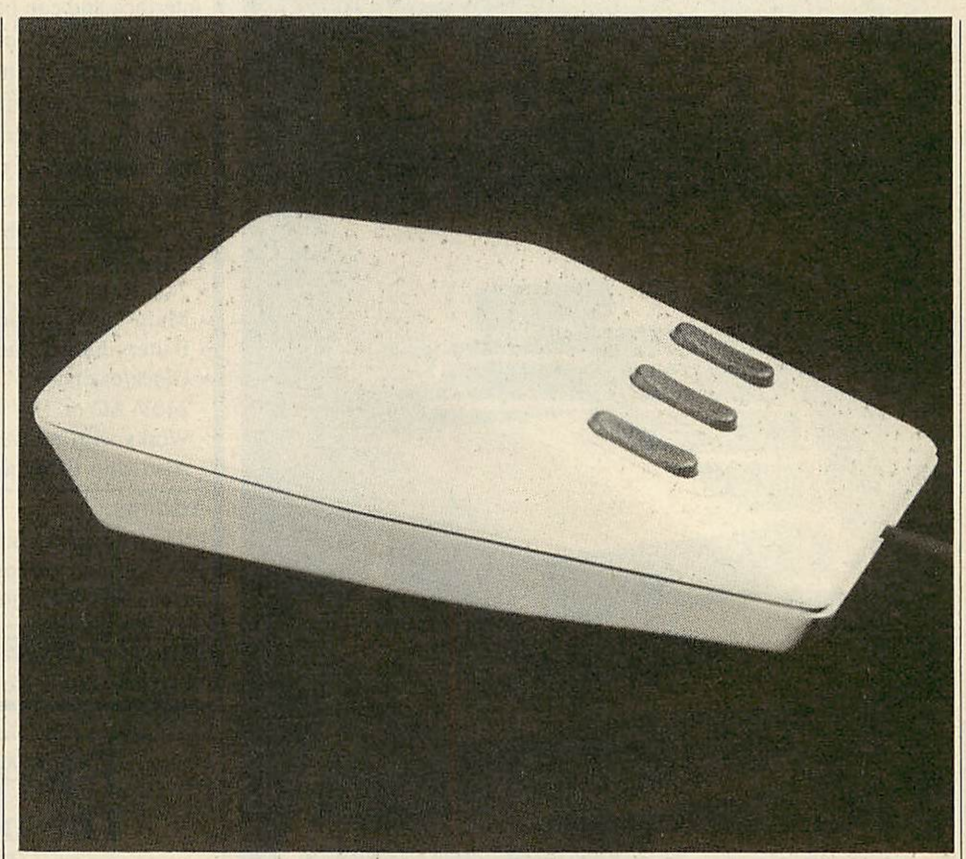
Icons are really just an alternative type of menu, and the mouse is just another way of moving a cursor around. The mouse (or trackerball, which is just a mouse on its back) does however have certain advantages, so let's look at how it actually works.

Cursor keys and joysticks work by closing switches which are periodically monitored by the operating system. While a switch is closed, a cursor move routine is repeatedly called, so the total cursor movement depends on how long (time domain) the switch is closed.

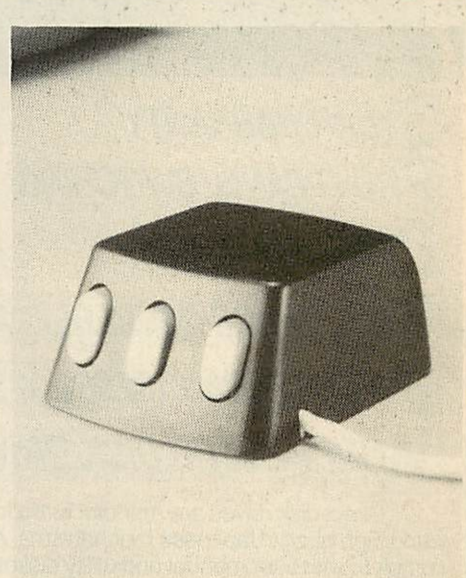
The mouse operates on a totally different principle. Instead of holding a switch closed until an auto-repeating cursor gets to the point you want, the movement of the mouse directly and proportionally controls the cursor.

There are two types of mouse. The cheap and nasty (though not all that much cheaper these days) contains a voltage reference and potentiometer (variable voltage divider) for each screen axis, which outputs a control voltage from the unit to the micro analogue port. This is converted into a binary number which is interpreted as an absolute position on the relevant screen axis. This type of mouse (I have seen no trackerballs of this type) suffers from indecision. It can be quite difficult to position the cursor accurately due to noise and inaccuracies in the conversion of the analogue signal from the ball. There is also inevitably a finite stop at each end of the ball's travel for each axis, due to the end of track stop of the potentiometer. This can be very annoying when you run out of movement unexpectedly in the middle of some work.

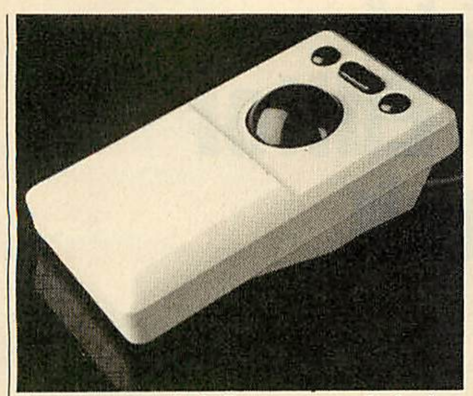
The professional grade mouse or trackerball uses a completely different system. A mechanism on each axis generates a dual pulse train as the ball rotates. This is a







The three best-selling mice available for the BBC micro. Top is the Megamouse from Wigmore, bottom left is the Nidd Valley Digimouse and right the AMX Mouse


The Marconi trackerball; a mouse on its back

'quadrature' system, ie, the two pulse trains are 90 degrees out of phase.

The technique allows direction to be interpreted: if pulse train one leads pulse train two, one direction is inferred, and if two leads one, the opposite direction is inferred. The direction is determined either by software, as on the BBC micro, or by special logic hardware. The result of either approach is loaded into an up/down counter, the content of which is normally the absolute cursor position on a given axis. This increments and decrements as the ball rotates, but the absolute value in the counter is at any time modifiable by the micro. The ball has no end stops, so to home the cursor, for instance, the micro clears both counters to zero, regardless of the position of the ball. The result is a very controllable cursor: its speed and screen area coverage depend on the combination of real-time modifiable software control and direct response to the ball movement.

The real place where icons, mice and so on are essential is the multi-megabyte workstation. If you have a CAD (computer aided design) system with a choice of 4096 graphics colours, specifying a colour by name is obviously difficult. A sequence of colour patch palettes across the bottom of the screen can be traversed by a mouse-controlled cursor with great ease and speed. There is no reason, however, why they should not be applied and used on the home micro, subject to the normal memory demand considerations.

£10 SPRITELY ATOMS

Atom enthusiast Robin Tucker from Aldershot has sent me a nice sprite generator program (listing 1 on page 57). It allows generation of sprites up to 16 by 24 pixels, and automatically produces left-to-right transposition and colour inversion in Atom mode 4. The resulting sprite library can be saved to disc, and sprites can be moved on a byte shift basis by the accompanying move subroutine (listing 2).

The program displays a design box with a movable pointer on each axis. Pixels are plotted at the co-ordinate intersect of the two pointers.

The sprite generator program is subdivided as outlined below: lines 10 to 399 handle display and keypress/function interpreter. Labels are as follows:

a initialise and assemble key capture code
b check pixel pointers in bounds
c clear pixel pointers
d plot colour pointer
e plot sprite pixel and also the transposed sprite pixel
f copy sprite to stored set
g copy transposed sprite to stored set
h plot stored sprite pointer
i copy pointed stored sprite to design box
j invert colour of sprite and transposed the sprite
k copy pointed stored sprite to transposed design box
l clear design and transpose design boxes
m save sprite set to disc
n load sprite set from disc
o clear sprite set from screen
p quit program.

The keys used are as follows:

Pixel pointer –
Z left
X right
[up
/ down
C change colour
] plot sprite and transposed sprite pixels
@ save sprite to set
/ save transposed sprite to set
H move sprite set pointer
R transfer sprite to design box
4 transfer sprite to transposed box
3 invert sprite and transposed sprite
7 clear design boxes
M save sprites to disc
D clear screen
Q quit program

The sprite mover works on a byte wide copy (exclusive OR) basis, line by line of the sprite. The entry parameters are:

#85 (Y reg) the width of the sprite in whole bytes
#84 (X reg) depth of sprite in pixels
#80/#81 vector containing address of top left byte of current sprite position
#82/#83 vector containing address of top left byte of desired sprite position.

This is a very reasonable effort, both in concept and programming, so thanks Robin, we're sending you a tenner. One improvement would be a sprite mover which worked on a pixel shift increment in the horizontal axis.

Any readers with such a routine are welcome to send it in.

VIDEO VARIATIONS

In December's Forum, I presented a neat tip from Cad Delworth which enables you to use mode 6 with a coloured background and user-defined characters, without the white stripes between the text lines. This fix elicited two responses, the first from Patrick Black in Cumbria. He asks whether there is a similar fix for the Electron.

The mechanism of the BBC micro fix is applicable solely to the BBC micro implementation of the 6845 (6545) CRTC chip, so you will have to determine the Electron video display mechanism to find a solution. Unless I'm mistaken, the Electron does not use the 6845 CRTC anyway, so I can't really advise. Any reader who has solved this problem might like to send in their answer. Sorry about that, Patrick.

Graham Patterson sends in the second point. On his monitor/BBC micro combination, he had to adjust the major (integer) horizontal total register of the CRTC, as the total adjust register does not provide a sufficient range.

His solution is:

```
VDU23,0,9,7,0;0;0;
VDU23,0,4,38,0;0;0;
VDU23,0,5,0,0;0;0;
```

This is not surprising. It is nothing to do with the BBC machine, but is a result of the differences between monitors. Practically all monitors have a bit of latitude in the vertical synchronisation which provides a stable frame. Several American micros (eg, TRS80) put out 60Hz video frame rate, but the average British monitor (designed for 50Hz frame rate) can lock to it. Graham mentions that his micro is 'rather ancient'. If his monitor is of similar age, it may be a little out of adjustment. This is, however, the sort of detail that you expect to have to set up for yourself, so don't worry if your gear needs different values again: experiment until it is right.

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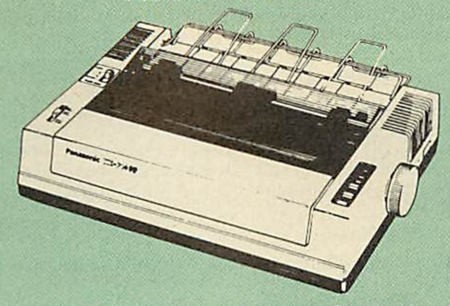
```
10REM ********************
20REM * SPRITE GENERATOR *
30REM ********************
40
45GOS.a
50CLEAR4
70MOVE7,(185+1)
80DRAW24,(185+1)
90DRAW24,(159+1)
100DRAW7,(159+1)
110DRAW7,(185+1)
120MOVE7,(155+1)
130DRAW24,(155+1)
140DRAW24,150
150DRAW7,150
170DRAW7,(155+1)
180GOS.b;GOS.d
185?H=-1
200LINK AA0
210IF?£80=58;GOS.c;B=B-1;D=D+1;GOS.b
220IF?£80=55+1;GOS.c;B=B+1;D=D-1;GOS.b
230IF?£80=1;GOS.c;A=A+1;C=C+1;GOS.b
240IF?£80=31;GOS.c;A=A-1;C=C-1;GOS.b
250IF?£80=35;GOS.d
251IF?£80=3 GOS.e
252IF?£80=32 GOS.f
253IF?£80=2 GOS.g
254IF?£80=40;?H=0;H=H+2;F=F+2;GOS.h;?H=-1
255IF?£80=50;GOS.i
257IF?£80=19;GOS.j
258IF?£80=20;GOS.k
259IF?£80=23;GOS.l
300IF?£80=45;GOS.m
301IF?£80=45+1;GOS.n
302IF?£80=35+1;GOS.o
303IF?£80=49;GOTO p
304IF?£80=42;?H=0;H=H-2;F=F-2;GOS.q;?H=-1
399GOTO200
498END
500aREM VARIABLES+
510A=185;B=8;C=185;D=47;E=1
520DIM AA(3),P(-1)
530F=£8540+£100;H=£85A0
540G=£9000
570I=£9000;P.$21;[:AA0
580JSR£FE71;STY£80;RTS;]
585P.$5+1;R.
700bREM POINTERS
710IF A=185+1;A=185
720IF A=150+10;A=151+10
730IF B=7;B=8
740IF B=24;B=23
750IF C=(185+1);C=185
770IF C=150+10;C=151+10
780IF D=31;D=32
790IF D=48;D=47
800PLOT15,7,A
810PLOT15,B,(185+1)
820R.
840cREM DELETE POINTERS
850PLOT13,7,A
870PLOT13,B,(185+1)
880R.
900dREM DRAW COLOUR POINTER
910F.T=154 TO 152 S.-1
920MOVE9,T;PLOT(5+1),22,T
930N.;IF E=1;E=0;R.
940IF E=0;E=1
941R.
950eREM PLOT POINT ON GRIDS
970IF E=0;PLOT13,B,A;PLOT13,D,C
980IF E=1;PLOT15,B,A;PLOT15,D,C
990R.
1000fREM SAVE TO SET
1001J=£80C1
1010F.T=F TO F+(£20*24) S.£20
1020?T=?J;?(T+1)=?(J+1)
1030J=J+£20;N.;R.
1040gREM SAVE MIRROR TO SET
1050J=£80C4
1055F.T=F TO F+(£20*24) S.£20
1070?T=?J;?(T+1)=?(J+1)
1080J=J+£20;N.;R.
1110hREM SPRITE POINTER
1120IF H>£85BF H=£85A0;F=£8540+£100
1130?H=-1;R.
1150iREM RELOCATE SPRITE
1170O=F
1180F.T=£80C1 TO £80C1+(£20*24) S.£20
1190?T=?O;?(T+1)=?(O+1)
1194O=O+£20;N.;R.
1200jREM INVERT SPRITE
1210F.T=185 TO 151+10 S.-1
1220MOVE8,T;PLOT(5+1),23,T
1230MOVE32,T;PLOT(5+1),47,T;N.;R.
1232kREM RELOCATE MIRROR
1233O=F
1234F.T=£80C4 TO £80C4+(£20*24) S.£20
1235?T=?O;?(T+1)=?(O+1)
1237O=O+£20;N.;R.
1238lREM CLEAR BOX'S
1240F.T=185 TO 151+10 S.-1
1250MOVE8,T;PLOT7,23,T
1270MOVE32,T;PLOT7,47,T;N.;R.
1280mREM SAVE SPRITES (DISK)
1290*SAVE"MSPRITE"8640 8960
1291F.T=1 TO 5000;N.;P.$7$7;R.
1292nREM LOAD SPRITES (DISK)
1293*LOAD"MSPRITE"8640 8940
1294F.T=1 TO 5000;N.;P.$7$7;R.
1295oREM CLEAR MEMORY
1297F.T=£8500+£100 TO £8900 S.4;!T=0;N.;R.
1298pREM QUIT PROGRAM
1300P.$12"**********************************"
1310P."* ATOMIC SOFTWARE S.P.R.I.T.E. *"
1320P."**********************************"
1330P.''"YOU QUIT THE PROGRAM........."'
1340P.'"HAVE A NICE DAY!..."
1350qREM MOVE POINTER LEFT
1360IF H<£85A0;H=£85BF;F=£8640
1370?H=-1;R.
```

Robin Tucker's Atom sprite generator program

```
10REM MACHINE CODE
20P=£2800
30DIM VV(3)
40[
50LDA£83
60LDX£84
70:VV0 LDY£85
80:VV1 LDA(£80),Y
90 EOR(£82),Y
100 STA(£82),Y
110DEY
120BNE VV1
130LDA£80;CLC;ADC@£20;STA£80
140BCC VV2;INC£81
150:VV2 LDA£82;CLC;ADC@£20;STA£82
160 BCC VV3;INC£83
170:VV3 DEX;BNE VV0;RTS
180]
190END
```

The sprite generator move subroutine

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Panasonic RS232 Interface: **£39**

Panasonic KX-P1091 Dot Matrix Printer

Similar to KX-P1080 but has a speed of 120 cps and is IBM/Epson comptible

Price £249 (carr £7)

Panasonic KX-P3131 Daisy-Wheel Printer

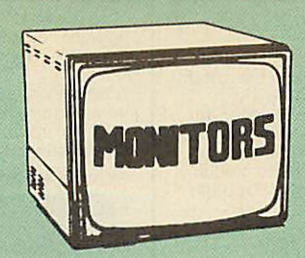
A few months ago, we introduced the KX-P1080 to our large and discerning customer base. As a result of the enthusiastic and overwhelming reaction to this versatile dot matrix printer (see above for details), we are now extremely pleased to be able to bring you details of the fabulous KX-P3131 Daisywheel Printer, also from Panasonic. The KX-P3131 printer is the ideal printer for the home user wishing to produce clear, immaculate letters or reports.

Ideally suited to the pocket of the home user, costing not much more than a pair of disc drives, this daisywheel printer delivers flawless text at 10, 12 or 15 characters per inch. It also supports proportional print mode.

Printing at a respectable 17 characters per second, the KX-P3131 features a capacious 6 kilobytes printer buffer to swallow most printing requirements with ease. For the more demanding user, there is a 32 kilobytes printer buffer option available. Taking paper up to 13.5" wide, the KX-P3131 prints with bidirectional logic seeking, ensuring the minumum time to print your text.

Only **£218** (carr. £7)

Single Sheet Feeder	**£195**
Tractor Feed	**£90**



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

- 1431 – Medium resolution as used on the BBC television computer programme **£175**
- 1451 – High resolution, suitable for word processing in mode 0 **£225**
- 1441 – High res, exceeds the capabilities of the BBC micro **£359**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£255**
- **TOUCHTEC** Touch Screen Pack **£219**
- Dust Cover for Microvitecs **£5.50**

KAGA-TAXAN 12"

- KAGA KX1201G Hi-res Green Monitor **£85**
- KAGA KX1202G Long persistence Hi-Res Green Monitor **£93**
- KAGA KX1203A Ultra-Hi-Res Amber Monitor **£93**
- KAGA Vision 2 Hi-res RGB Colour monitor. Ideal for Wordprocessing **£260**
- **Kaga Super Vision 3,** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£320**

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res	£69
Amber (New Design) Hi-res	£74
LEADS	
BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for KAGA	£3

N.B. carriage on Monitors **£7** (securicor)

SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

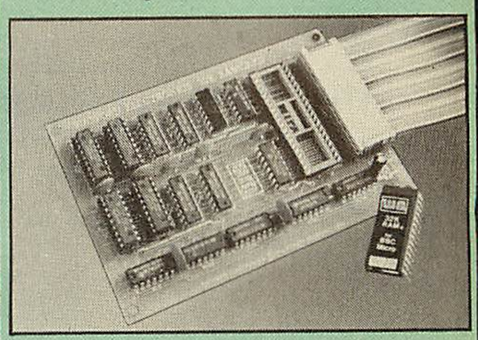
A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computer Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £89 (carr £2)

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B+ or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!
- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

Continued



Mark II Light Pen

You no longer have to fiddle with the brilliance control or work in the shade as this NEW Mark II Light Pen is totally insensitive to local lighting conditions. It only operates on high frequency light from the TV or Monitor. The red LED Indicator on the Mk II pen, lights up when valid video data is available. Your program can have access to this signal allowing computer verification of target for high res drawing. The conveniently located switch on the pen body allows the computer to ignore any stray signals. Supplied complete with the sophisticated PEN-PAL Software on Cassette or Disc. Please specify.

Special Offer Price: £15

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED (BOOK)

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

NOW WITH EXTRA FEATURES AT NO EXTRA COST
Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities ten simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for four years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).***

PRICES

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£62**
- *Acorn's 0.90 DFS Kit complete* **£57**
- *DFS Manual (Comprehensive)* (no VAT) **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£46**
- *DDFS Manual* (no VAT) **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£29**

BBC MICRO BUSINESS/ WORD/PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). Please telephone or call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE

BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40-80 track double sided Disc Drives, Zenith Hi-Res green monitor, Panasonic KX-P3131 professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £899

A Low Cost wordprocessing package: Same as above except, a single disc drive instead of a twin and Olivetti Spark Jet Printer instead of Panasonic.

Only £625

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive[What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin[What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4



STAK-PAK

The unique computer program filing and storage system. Made of tough black plastic, these compact drawer sections hold two cassettes each and lock together vertically to form miniature cabinets of any height. Each drawer section has two C12 Data Cassettes with labels plus external index card.

Five twin Packs incl. 10 Cassettes Only: **£5**

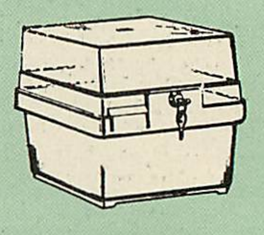
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

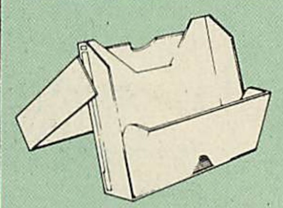
£8

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



- M35 - holds upto 50 discs **£8**
- M85 – holds upto 95 discs **£10**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) ***£3.20*** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our drives are of Japanese manufacture. All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

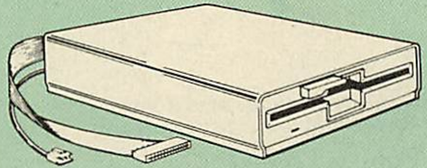
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

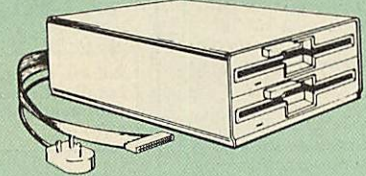
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 10th page of our advert for the Plinths).

P.S. All our 5¼" Disc Drives are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £95		CS 200 £108	
400K (720K)	CLS400S £96	CLD 400 £180	CS 400S £109	CD400 £200
800K (1.44M)		CLD 800S £183		CD 800S £204

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40-80 track).

3M – DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × 5¼" S/S D/D 40 Track Diskettes* ***£10***
- *10 × 5¼" D/S D/D 40 Track Diskettes* ***£12***
- *10 × 5¼" S/S D/D 80 Track Diskettes* ***£15***
- *10 × 5¼" D/S D/D 80 Track Diskettes* ***£15***
- *Hi-Density 10 × 5¼" 1.6M D/S D/D for IBM* ***£32***
- *10 × 3½" S/S D/D 40/80 track Discs* ***£20***
- *10 × 3½" D/D D/D 40/80 track Discs* ***£24***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × **M3** 3½" D/S D/D 80 Track Discs* ***£20***
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* ***£9***
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* ***£11***
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* ***£14***
- *3" Double Sided Discs* ***£3 each***

Special BULK OFFER on 5¼" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 80T	D-S 80T
● Without Sleeves	£49	£74
● With Sleeves	£50	£75

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050; 30 Megabytes £1549**

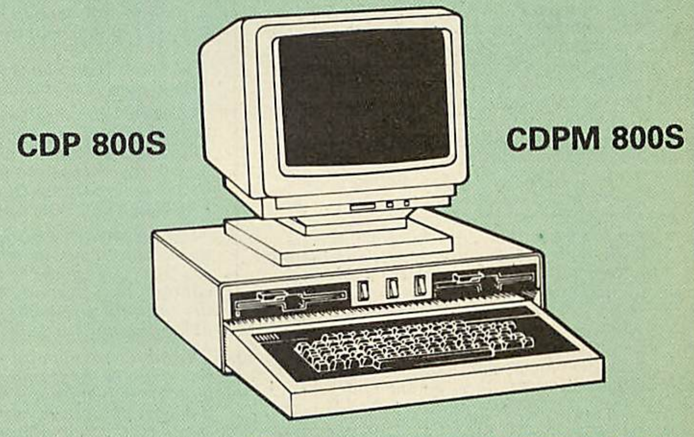
WATFORD's WINCHESTER DRIVES

- 20 Megabytes with ADFS **£635**
- 40 Megabytes with ADFS **£999**

WINCHESTER WORKSTATION

20 Megabyte Winchester, plus a Tape Streamer and a 400K Floppy Drive all housed in a plinth with cooling fan **£1499**

CDP 800S **CDPM 800S**



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £210

CDPM 800S for Master £225

(Securicor Carr. £7)

ACORN's Special Twin 800K Disc Drives

Specially mounted side by side in a Master Plinth. Supplied complete with Manual and Cables. Plugs directly to the Master Computer.

RRP £250 **Our Price: Only £199** (carr £7)

EPSON NLQ ROM
for the BBC Micro

Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:

- Simply type *NLQ80-100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80) ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set) Standard 'pica size') Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00
(Hi-View compatible)

THE NLQ DESIGNER

(The First & still the Best)

KAGA KP810-910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted. Now BBC Master compatible.

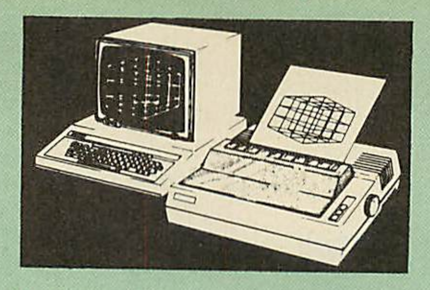
A 40 or 80 track (please specify) FONT Disc containing 9 Fonts, (Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print, Gothic and Greek is now supplied FREE with every package.

(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines(
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provides) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of ßGIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

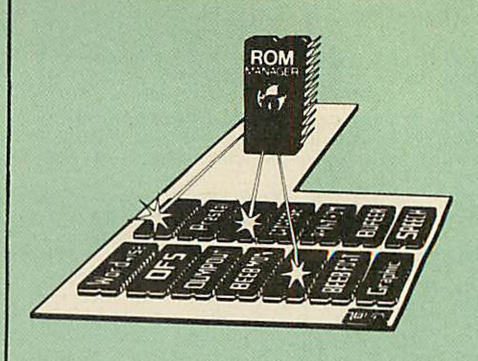
Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally etc.

Price including comprehensive manual

£25

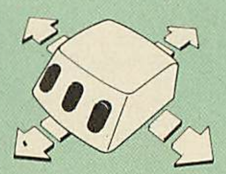
ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.
Many more facilities available.

SPECIAL OFFER £20

THE AMX MOUSE



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £63 (carr £1.50)

We are giving away, absolutely **FREE**, our popular Colour Art software package worth **£15** with every AMX Mouse package purchased from us.

AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£42**
AMX PAGE-MAKER Pack Best desk-top publishing software. Works with keyboard, joystick and AMX Mouse	**£32**
AMX 3D ZICON Disc	**£19**
AMX Database Disc	**£19**
AMX XAM Educational	**£19**
AMX MAX(A gem of desktop (ROM)	**£17**

RB2 MARCONI TRACKER BALL

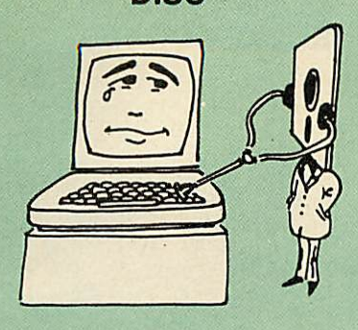
This popular unit is supplied complete with software.

Price: **£50**

FLEET STREET EDITOR

Software pack **£35**

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.
At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BBC Publication's Popular Educational Software

- Maths with a Story 1 (Cassette). 4 primary level maths programs **£10.95**
- Maths with a Story 2 (Cassette) 4 further maths programs **£10.95**
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs **£19.95**
- WAVES: Science Topics (Disc) CSC O Level Physics program. **£14.95**
- RELATIONSHIP: Science (Disc) O Level Biology program. **£14.95**
- BONDING: Science (Disc) O Level Chemistry program. **£14.95**
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. **£14.95**
- ELECTRONICS IN ACTION (Disc) O Level program **£14.95**
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. **£20**
- ECOLOGY (Disc) O Level program. **£20**
- POLYMERS (Disc) O Level program. **£20**
- Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20**
- FOOD & POPULATION (Disc) O Level program. **£20**
- MICROTECHNOLOGY (Cassette) O Level program. **£6.95**
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. **£17**
- DEUTSCH DIREKT! (Disc & Audio Cassette) **£20**

TED

The Teletext Editor Package for serious users

TED is the brand new package from Watford Electronics for the editing and creation of teletext (Mode 7) screens and displays. TED is ideal for anyone wanting to create their own Mode 7 pictures (such as game title pages), designing animated displays for shop windows, exhibitions, classrooms, etc. TED is also probably the most powerful Prestel screen editor you will ever come across.
Supplied on a special 32k package, full facilities are providing for manipulating the screen, including easy to use pixel manipulation; line, column and block buffering and copying; left and right margins; large text in a variety of different fonts (contained within the ROM device); various borders and effects templates (contained within the ROM device); line and column insertion and deletion; easy to use graphics line drawing. Those are some of the features of editor itself. In addition to this, TED contains routines for taking a number of Teletext screens and creating them into an animated sequence, with user selectable display times, repeats on a group of shows, various entry methods (how the picture is put onto the screen), routing selection (both predefined and keyboard specific), chaining of other shows, etc. Scrolls treat the Teletext sequence as a very long page with a window onto it. Supplied complete with a comprehensive manual. There are many more facilities not mentioned here, so write in for a comprehensive leaflet; you'll wonder how you managed without TED.

Price: £35

ROM-SPELL

"way ahead of any competition"



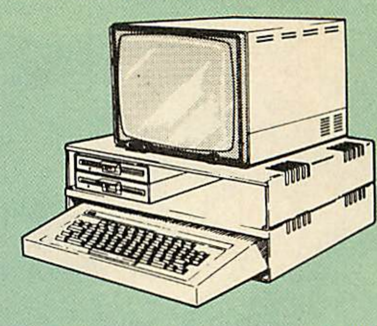
ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.
"The editing system is very neat and simple, instead of replying to queries and beeps all of the time . . ."
"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary".
". . . that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".
". . . ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP-M and MSDOS, namely Spellstar and has a speed-performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".
". . . and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all".
Compatible with: View, Wordwise & Wordwise +.

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

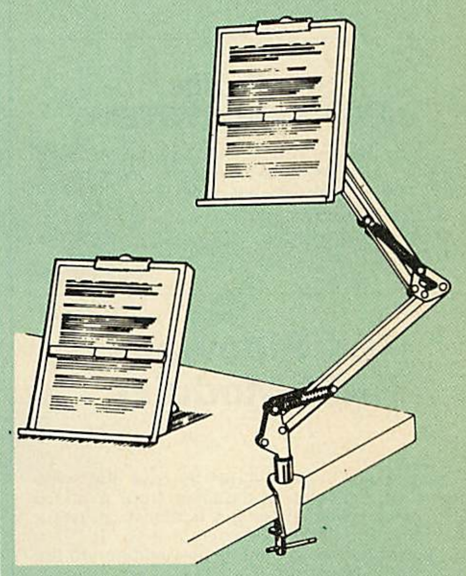
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

COPY HOLDERS



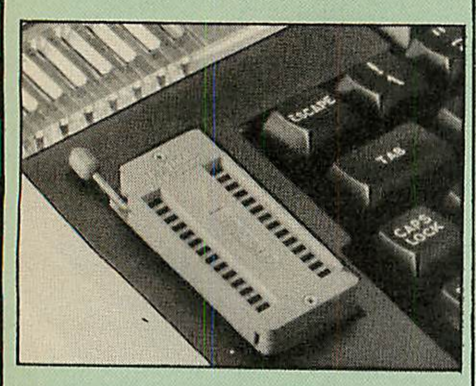
How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic rul er and a clip grip.

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

All prices in this advert are exclusive of VAT.

Continued


SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to instaii. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

16K DISC RAM

Unlike other RAM boards, this revolutionary, battery backed up, write protectable 16K sideways RAM board allows you to run from disc every sideways ROM available.

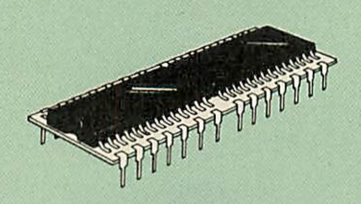
Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £32 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM



This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

Only **£28** (carr 2)

Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.

Do you require:

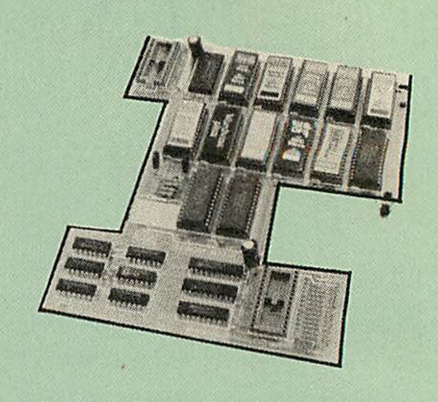
- Sideways RAM for a BBC B+ Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- An easy to use utilities disc| Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM

GRAPH PAD 2

Supplied complete with Software
£60 (Carr. £3)

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)



The BBC B+ Micro ROM EXPANSION BOARD

Specially designed for all BBC Plus users, this board sits in an external box, and will accept either 10 off 16k EPROMs, OR 10 off 32k EPROMs.

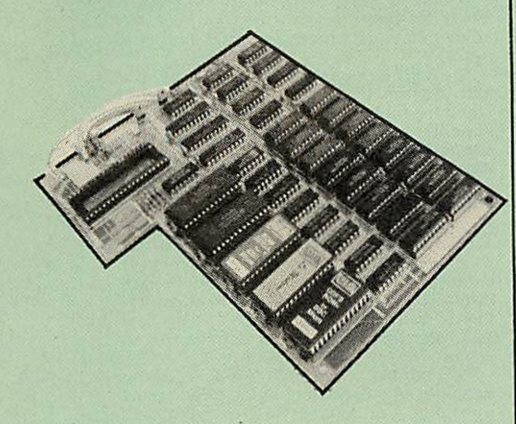
With the 32k EPROMs, only 5 can be 'online' at once (that's all the B+ can address, as each chip 'holds' two normal sockets worth), but you can swap between the two banks if necessary. With the 16k EPROMs, you can obviously address them all at once. An extra card can be added to permit 2 banks of 10 EPROMs to be used (again with only one bank available at once).

The ROM box, which has its own mains power supply, and connects to the BBC Plus via a specially designed card (which is a buffered card for your peace of mind) permits easy access to the EPROMs via the hinged lid. NO soldering is required for this board.

£79 (carr £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- *ROM/RAM card with 32k dynamic RAM* ***£39***
- ROM/RAM card with 64k dynamic RAM ***£52***
- ROM/RAM card with a massive 128k dynamic RAM ***£80***

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- *16k plug-in Static RAM kit* ***£6***
- *16k Dynamic RAM for Upgrade* ***£7.50***
- *Battery backup* ***£3***
- *Read and Write protect switches* ...... ***£2 each***

Complete ROM-RAM board (all options installed) ***£89***

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

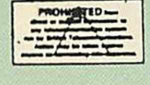
The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***
- *BT Approval applied for.*

(When ordering, please specify the version required, (BBC or Master)

SPECIAL OFFER

Price: **£74** (carr £3)

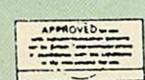


(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

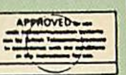
£99



(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Nightingale Modem without software	**Only £87**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial-Auto Answer Board (non BABT)	**£48**
Auto Dial Utilities Disc	**£9.50**
OBBS Bulletin Software	**£20.00**

APOLLO



The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75**
(Carr £3)
(Write in for full specification)

BT TELEPHONE CONNECTORS

LJU	1/4A Mini Line Master	**£4.50**
LJU	1/6A Mini Line Slave	**£3.00**
LJU	2/4A Line Master	**£4.00**
LJU	2/6A Line Slave	**£2.50**
LJU	3/4A Flush Master	**£3.95**
LJU	3/6A Flush Slave	**£2.75**
LJU	10/3A Dual Splitter	**£5.50**
	4 Way BT Plug	**£0.75**

Versatile **BEEB SPEECH SYNTHESISER** Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued



COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise

£24

Wordwise plus

WORDWISE PLUS
£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET ONLY £37



ONLY: £26

Inter-WORD

Only: £42

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

Only: **£39**

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£37

VIEW 3.0 ROM

Price: Only **£54**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£36

VIEWSHEET (Acornsoft)	£37
VIEWSTORE	£37
VIEWSPELL with 80 track disc	£29
VIEWPLOT Disc	£22
VIEW-INDEX	£12

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER HR15 PRINTERS

Only £10

VIEW-VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

Only: £10

MINI OFFICE II (disc)	£14.50

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)



ARABIC ROM
for the BBC Micro

The ALNOOR ARABIC ROM converts your BBC into a bilingual computer. New keytops provide both English and Arabic symbols. Two sets of Arabic symbols are provided for use in either context sensitive or insensitive operation.

. 20, 40 and 80 column operation. Compatible with ASMO (449). English-Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

VIEW PRINTER DRIVER ROM

(Professional facilities for demanding users)

View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's *printer command* with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234-33383

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8
P.S. This includes the Acorn 6502 & Z80.

A give away at . . . **Only £29**

Please specify 40 or 80 track disc when ordering.



ARIES CORNER

Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20: the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

THE ARIES RANGE HARDWARE REQUIREMENTS

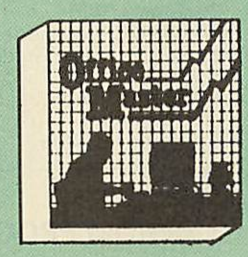
Aries B-32 & BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 & BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21**
(Cassette or Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS
- WORD PROCESSOR

DATABASE – Set up a computerised "card index" system and add records/data to the file your way. Features include search, sort, mathematical calculations, printer routines, data summaries, etc.

SPREADSHEET – Offers a wide range of invaluable calculation and editing features. Beebplot will take files created by Beebcalc to provide data portrayal in graph, histogram or pie chart format.

BEEBPLOT – Provides an easily assimilated visual representation of numerical data.

WORDPROCESSOR – Provides many routines found in large and expensive packages.

OFFICE MATE Only £10
(Cassette or Disc)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degredation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24.**

MEGABUFFER 256

This new Megabuffer 356 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £99 (carr £2)

L.B.O. Rom

Life & Business Organiser

Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are ever likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!

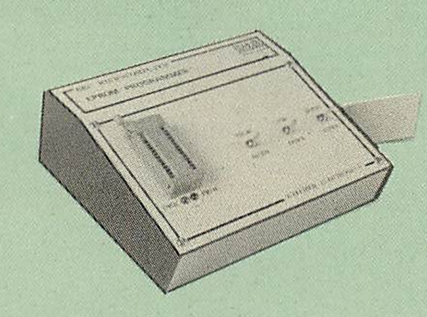
Price only: £17

Continued


BOOKS (No VAT on Books)

15 Hrs Word Processor Using BBC	£3.95
30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£19.95
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BBC Wordprocessor Beginners Guide	£7.95
BBC Within the Micro	£13.95
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DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
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Introducing LOGO	£5.95
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LISP the Language of Artificial Intelligence	£9.95
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Wordprocessing BBC Beginners Guide	£7.95
Wordstar & CP/M made easy	£7.45
Wordwise + A User Guide	£9.95
Z80 Applications	£15.95
Z80 Assembly Language Programming	£19.95
Z80 Reference Guide	£9.95

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette-disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

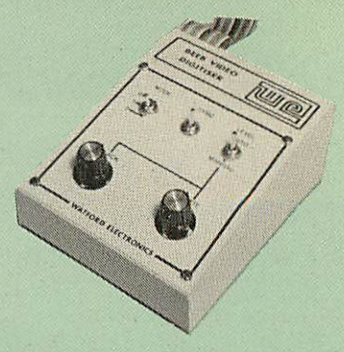
SPECIAL OFFER £69 (£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

BEEB VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£129.00** (carr. £3)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	£10
Delta 3B Twin Joysticks	£16
Delta 14B Single Joystick	£12
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7

ROM EXTRACTION TOOL

This extremely useful tool allows you trouble free chip removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.
Price: **£2**

ACORN MUSIC 500

BBC B, B+ & Master compatible.

You too can acquire this music package that has already thrilled thousands, for:

ONLY £49 *(carr £3)*
(included FREE with every unit, 'MU-500' software disc worth £6)

ATTACHE CARRYING CASE for BBC Micro

This attache carrying case is attractively finished in mottled antique brown leatherette. An ideal and safe way of carrying your BBC Micro around. Supplied with two Keys.
Price: **£13** (£2 carr.)

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL HEADER PLUG

SOLDER type	£1.50
IDC CRIMP type	£1.95

SPARES for BBC Micro

Keyboard	£46	Keystrip	£2
UHF Modulator	£4	Case	£25
Speaker Grill	£1	Speaker	£2
Power Supply	£59	Keyswitch	£1.50

Replacement FLEXIBLE 17 way Keyboard Connector £3

8 WAY DIP SWITCHES

With these DIP switches soldered to their keyboard, any BBC B or B+ owner can take full advantage of the fast disc drives that we supply by configuring his BBC for fast disc drive operation.
Excellent value for money at **£1.00**

CONNECTING LEADS

(All ready made and tested(

CASSETTE LEADS 7 pin DIN Plug

to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	£2.50

DISC DRIVE POWER LEADS
Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

DISC DRIVE INTERFACE LEADS
BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	80p	200p
BBC Power Plug 6 way	80p	–
Disc Drive Plug 4 way	75p	–
6 way Power Connector	–	95p

Watford Dealer's List

UNITED KINGDOM

Badger Micros (Devon), Badger's Hill, Southerton, Ottery-St. Mary, Devon EX11 1SE. Tel: 0395 68516.

Beebug Retail, Dolphin Place, Holywell Hill, St. Albans.

Cambridge Computer Store, 4 Emmanuel St., Cambridge CB1 1NE. Tel: 0223 358264.

Cirkit Distribution Ltd, Park Lane, Broxbourne, Herts.

C.J.E. Micros, 78 Brighton Road, Worthing, West Sussex. Tel: 0903 213361.

Dennis Spitz Computers Inc, 86 Golders Green Road, London NW11.

Farnell Electronics, Canal Road, LEEDS LS12 2TU.
Tel. 0532 636311.

HCCS, 575-583 Durham Road, Low Fell, Gateshead, Nr. Newcastle Upon Tyne.
Tel. 091 4870760.

Mancomp Ltd, Printworks Lane, Levenshulme, Manchester. Tel: 061-224 1888-9888.

Microman Computers, Rainford Industrial Estate, Mill Lane, Rainford, St. Helens

Peartree Computers Ltd, St. Georges Street, Huntingdon Cambs.

Verospeed Ltd, Boyatt Wood, Eastleigh, Hants.

OVERSEAS DEALERS

*Absolute Electronics, Rewal House, 208-210 La Trobe Street, Melbourne, 3000, Victoria, Australia. Tel: (03) 663 2411.

Alpha Computer Co, Shop 314 Chi Fu Commercial Centre, Chi Fu Fa Yuen, Hong Kong, Tel: 5-506592.

Computer Distribution Company, Parklaan, 47, B09300 Aalst, Belgium.

E.B.N., Elisenstrasse 13, 1000 Berlin 41.
Tel: (030) 7952057

Lendac Data Systems, Unit 31, IDA Enterprise Centre, Pearce Street, Dublin 12. Tel: 710796.

Scientex P.V.B.S., Zilversmidstraat 2, B-2000 Antwerpen, Belgium, Tel: 03 233 59 06

Techno-matic Data, Holbergsgade 19, 1057 Kobenhavn K, Denmark

*Velobyte, Scheaedyksadyk 5a-6a, 3011 EB Rotterdam, Holland, Tel: (010) 413 8197/414 5171.

Viking Tecno, Vestergade 12.1, 9620 Aalestrup, Denmark, Tel: 08 642522

*Acorn/Watford Referral Centres.

Viglen Console Unit

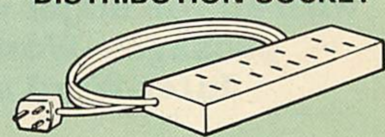
Enhance the appearance and convenience of your BBC Micro & Master with the Viglen console unit.
BBC **£42**; Master **£51** (carr. £4)

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources which put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only **£6.99**

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug.

£8.95 (carr £1.50)

Now also available with a built-in surge Arrester, providing Protection for your complete system.
Spikes Cleaner Unit: £12.50 (carr £1.50)

CHIP SHOP

8271	£36
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LM324	£0.45
SN76489	£5.50
SAA5050	£8.75
UPD7002	£4.40
2764-250nS	£2.50
27128-250nS	£2.75
27512	£18
4013	60p
4020	£0.90
4464	£8
4816 RAM	£1.75
6264LP-8K RAM	£3.00
6502A CPU	£4.75
65C02 3M	£9.75
65C12	£9
6512A	£10.00
6522	£3.40
6522A	£5.00
6845SP	£6.00
68B50	£2.95
7438	40p
74LS00	25p
74LS04	25p
74LS10	25p
74LS123	80p
74LS163	70p
74LS244	80p
74LS245	£1.00
74ALS245	£2.75
74LS373	£1.00
74LS393	£1.00
75453	70p

ASSORTED ROMS

ACORN BASIC 2	£19
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ACORN DNFS	£17
Acorn OS 1.2	£14
Acorn OS B+	£25
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BCPL Calc Pack	£15
BCPL Stand Alone Generator	£36
Basic Editor	£22
ULTRACALC	£52
BROM Plus	£32
Buffer & Backup	£20
Beebmon	£22
Beebfont	£25
Acorn COMAL	£36
Acorn FORTH	£32
Acorn Graphics	£25
Graphics Extension Rom	
GXR-B	£21
GXR-B+	£22
Acorn LISP	£35
Acorn LOGO	£42
ISO Pascal	£42
ISO-Pascal Stand Alone Generator	£30
ICON Master	£28
Logotron LOGO	£45
Micro Prolog	£62
Microtext Disc	£48
Mini Office ROM	£47
ROMIT	£29
Serial ULA	£13
Video ULA	£15
TERMULATOR	£25
MUROM	£21
SLEUTH ROM	£23
STUDIO 8 Disc	£18
Toolkit Plus	£31
Communicator	£49
Disassembler	£16
Help II	£27

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	HR15 Corr	£2.90	£2.50	£2.30
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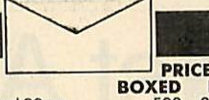
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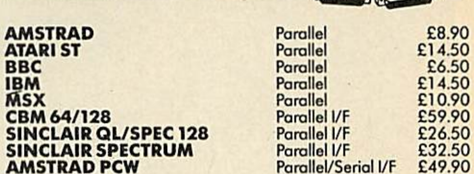
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DD50	5¼"	50	£8.90
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WALLET		20	£4.50



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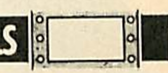
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Amstrad CPC464 Colour	£249.95
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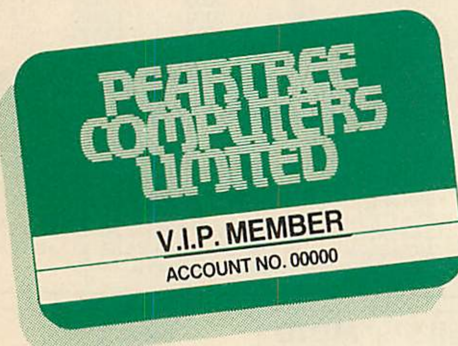
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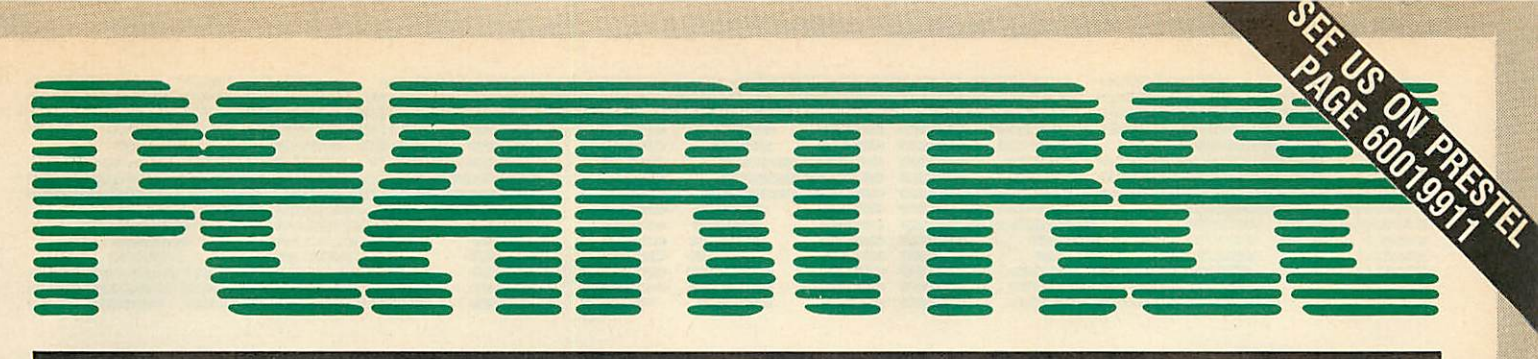
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PEARTREE

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- Two ROM cartridge sockets
- Numeric keypad

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- Will take ADFS for double density

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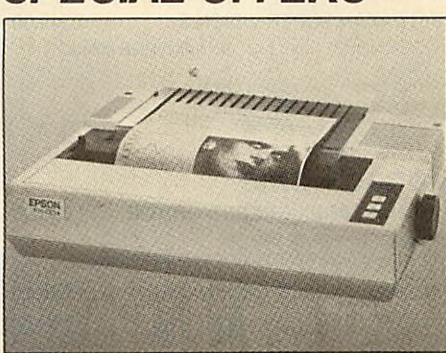
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SPECIAL OFFERS



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- 180 CPS
- Excellent near letter quality

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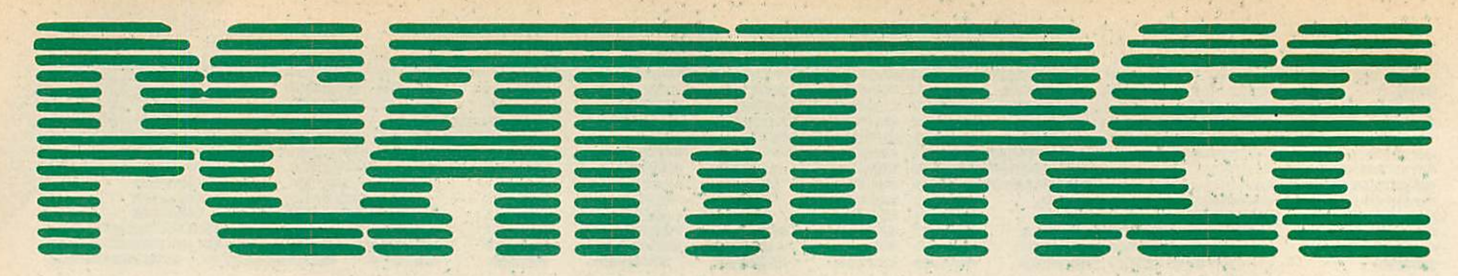
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- Supplied on 40/80 track disc

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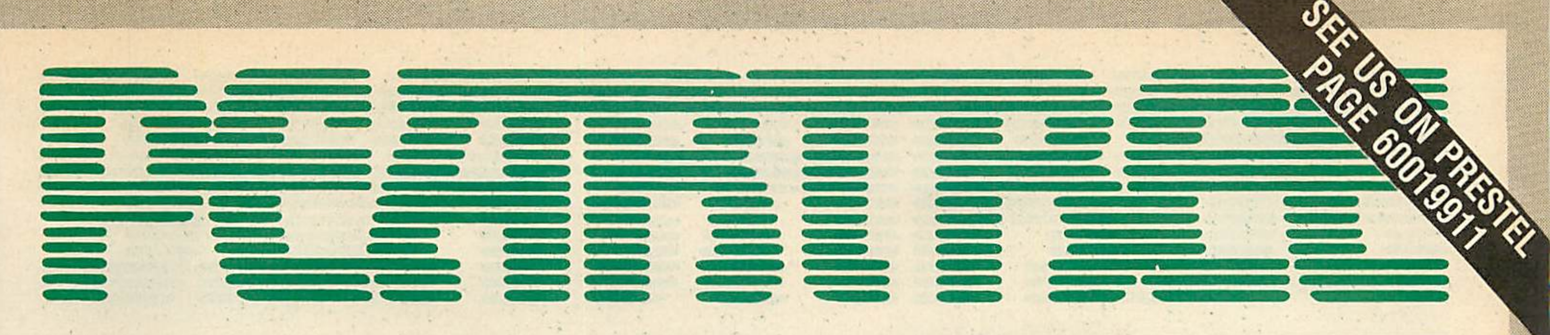
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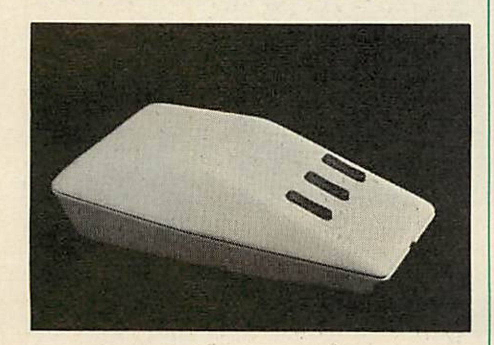


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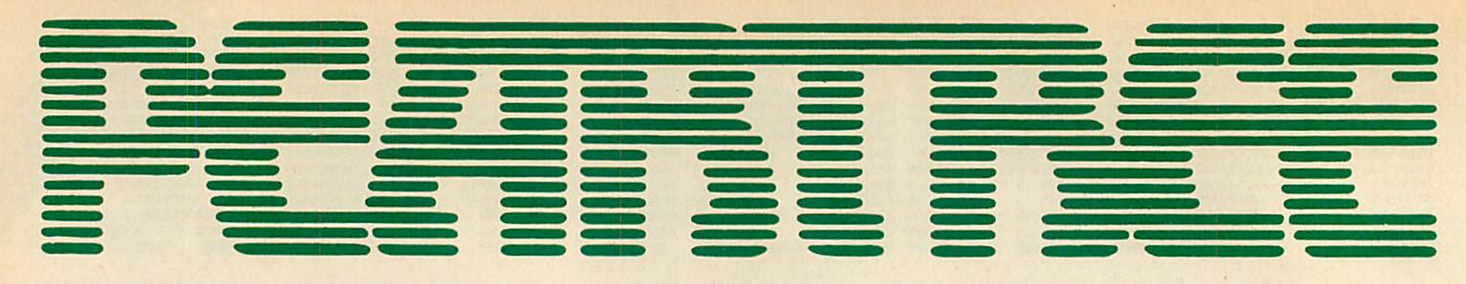
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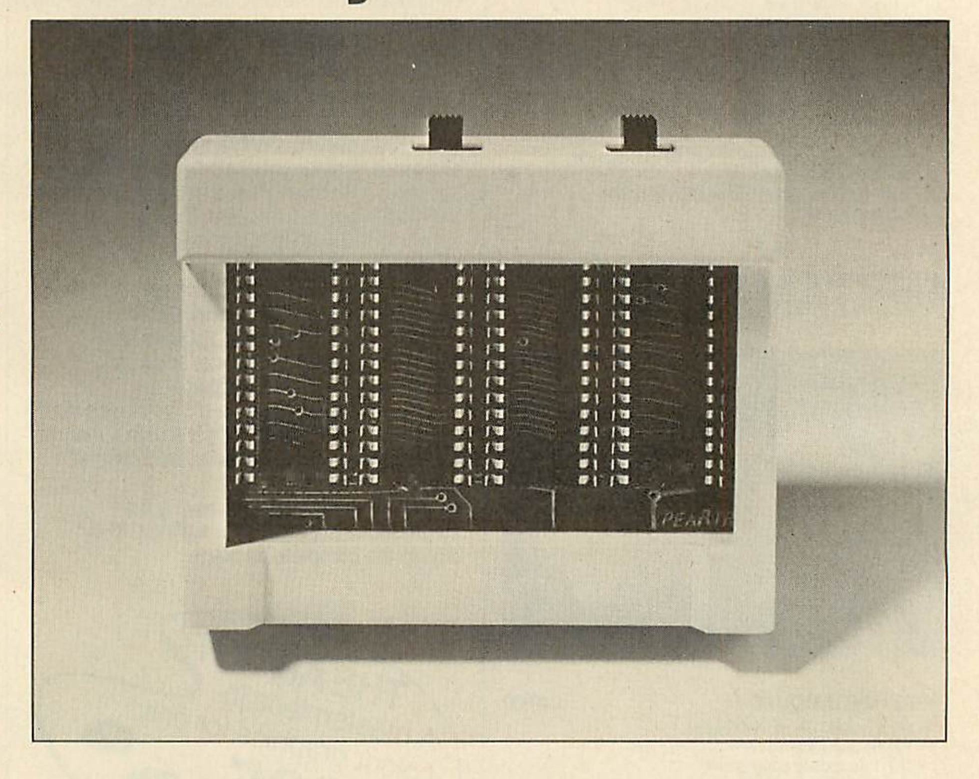


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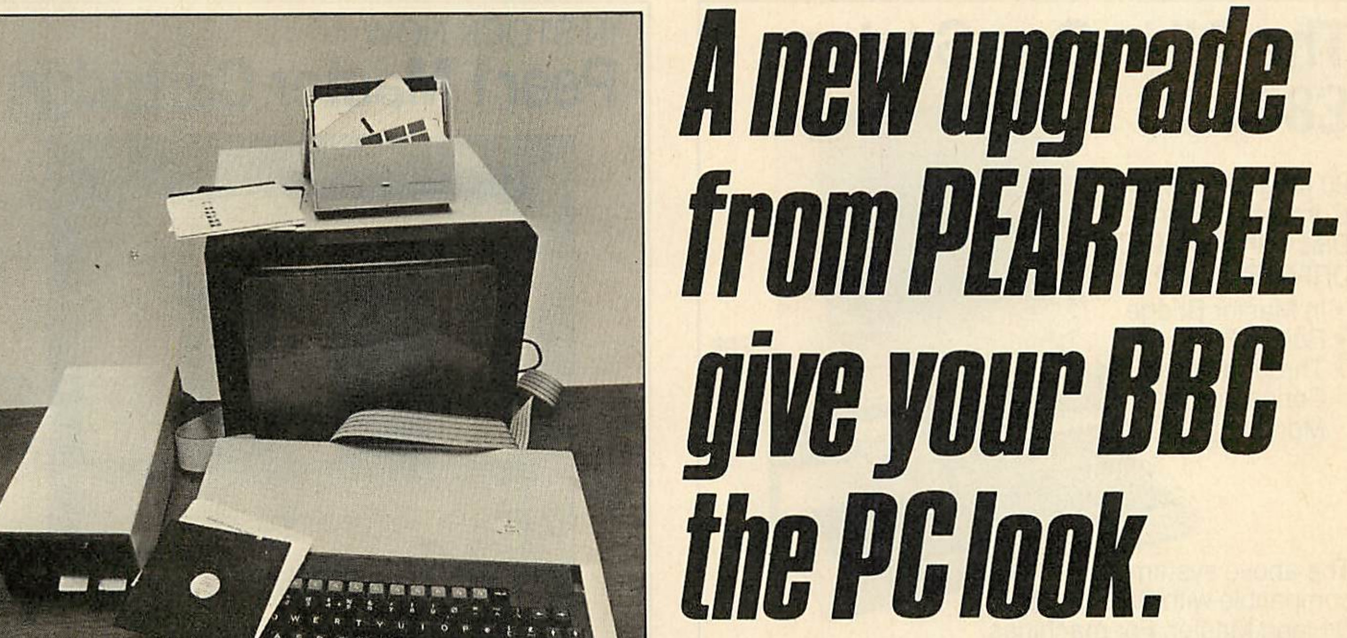
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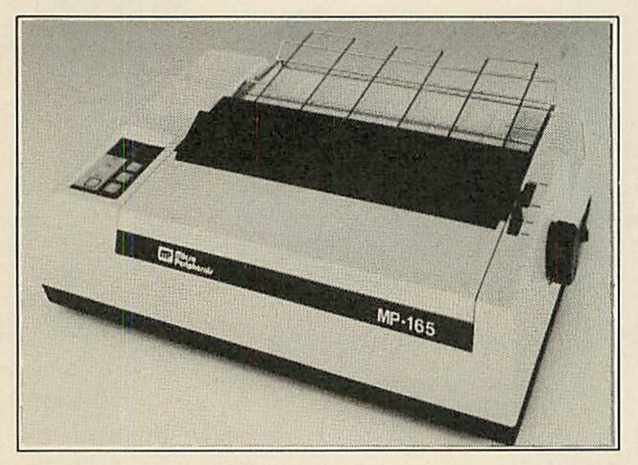
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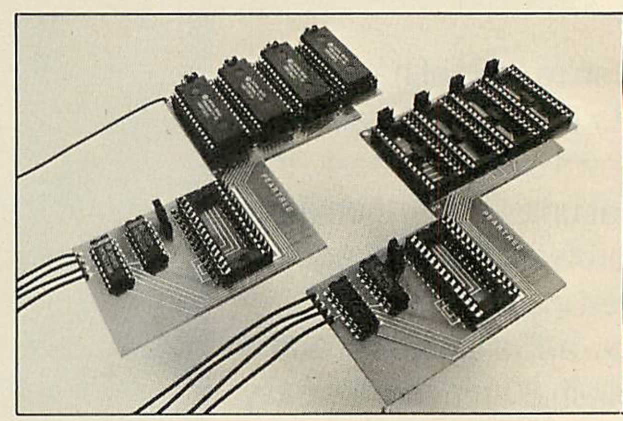
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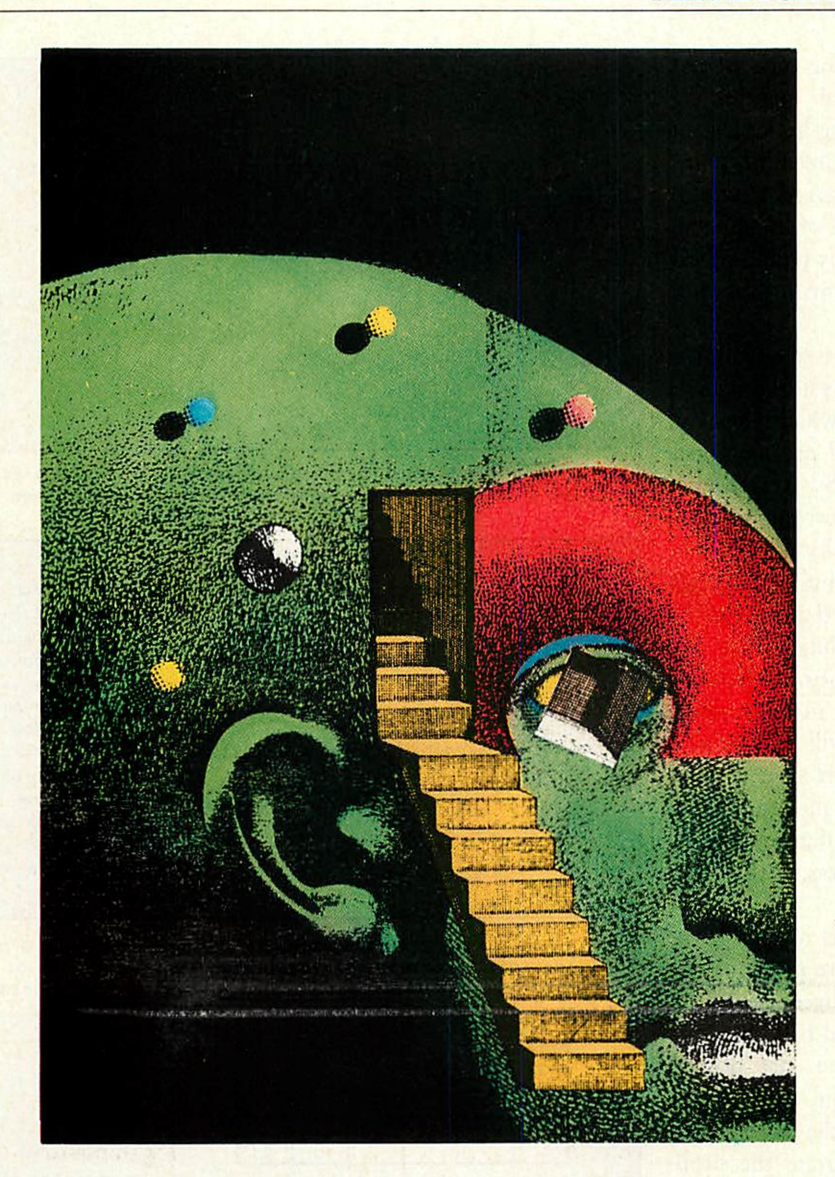


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I THINK, THEREFORE I AM

In this special feature we delve into one of the most controversial areas in computing today

David Johnson-Davies

ILLUSTRATION BY ANDRZEJ KLIMOWSKI

One of the most controversial areas in modern science is that of Artificial Intelligence, or AI. Work in this field takes advantage of the latest technology and most advanced computers available – and is vital to the concept of 'Fifth Generation' computing – but the aim of these articles is to enable owners of a BBC micro to explore some of the techniques in this area.

The emotive term Artificial Intelligence is used in two different ways. The first refers to the computer science discipline which produces systems of direct practical benefit in areas such as robotics, pattern recognition, speech recognition and natural language input/output. However, there are sceptics who believe that this area of practical research may not necessarily shed any light on the nature of human intelligence, and that progress in solving the practical problems in this area will not necessarily imply that we are coming nearer to understanding human intelligence. The more

controversial and interesting use of AI refers to the philosophical question of whether computers can ever be intelligent in the human sense, the problem of defining what lies between the present state of our knowledge and the task of building an intelligent machine. It is this philosophical question that will form the main subject of this article.

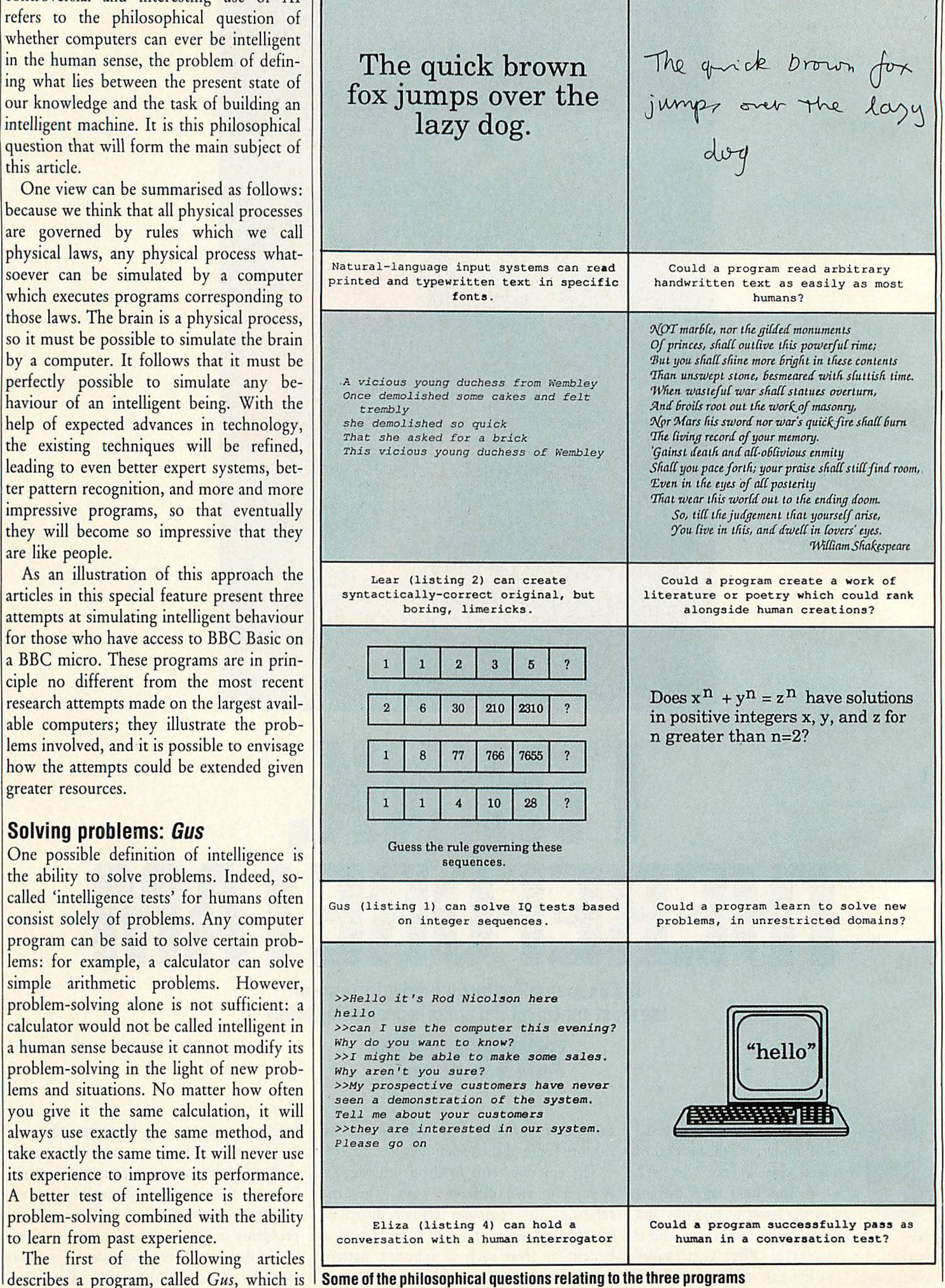
One view can be summarised as follows: because we think that all physical processes are governed by rules which we call physical laws, any physical process whatsoever can be simulated by a computer which executes programs corresponding to those laws. The brain is a physical process, so it must be possible to simulate the brain by a computer. It follows that it must be perfectly possible to simulate any behaviour of an intelligent being. With the help of expected advances in technology, the existing techniques will be refined, leading to even better expert systems, better pattern recognition, and more and more impressive programs, so that eventually they will become so impressive that they are like people.

As an illustration of this approach the articles in this special feature present three attempts at simulating intelligent behaviour for those who have access to BBC Basic on a BBC micro. These programs are in principle no different from the most recent research attempts made on the largest available computers; they illustrate the problems involved, and it is possible to envisage how the attempts could be extended given greater resources.

Solving problems: *Gus*

One possible definition of intelligence is the ability to solve problems. Indeed, so-called 'intelligence tests' for humans often consist solely of problems. Any computer program can be said to solve certain problems: for example, a calculator can solve simple arithmetic problems. However, problem-solving alone is not sufficient: a calculator would not be called intelligent in a human sense because it cannot modify its problem-solving in the light of new problems and situations. No matter how often you give it the same calculation, it will always use exactly the same method, and take exactly the same time. It will never use its experience to improve its performance. A better test of intelligence is therefore problem-solving combined with the ability to learn from past experience.

The first of the following articles describes a program, called *Gus*, which is



Some of the philosophical questions relating to the three programs

designed to solve problems, and learn from its experience. The problems it can solve are popular in IQ tests: finding the rule which determines what the next number should be in a sequence of integers. You may like to try the examples on the opposite page and examine the processes you use to find the answers, before looking at the solutions given in the article.

The important thing about *Gus* is that it attempts to solve such problems in the same way that people solve them – by forming and testing hypotheses. Human problem-solving often proceeds by the process of formulating a hypothesis about the structure of the thing we are studying, and then testing that hypothesis. As soon as the hypothesis fails a test we abandon it and try a new one. Furthermore, the hypotheses we form are influenced by the success or failure of similar hypotheses in the past. In a comparable way, *Gus* forms a hypothesis about the given sequence, tests it, and abandons it the first time it conflicts with the known facts.

Having found a correct hypothesis, it remembers information that makes it more efficient at discovering related hypotheses in future. Thus, the way that *Gus* generates hypotheses is influenced by its cumulative experience, so if a good way of formulating a hypothesis was found in the past, it will try it again.

The types of problems that it can solve expand in an unpredictable way with its learning, in the same way human beings do. As a result it is difficult to define the kind of problems that *Gus* can and cannot solve, because it can be led by steps along a route towards being able to solve many different types of sequence.

Computer creativity: *Lear*

Another possible definition of intelligent behaviour is that it is the creation of something new. Humans are creative, and in a sense create knowledge that did not previously exist. We would find it hard to deny a program intelligence if it were able to create a research paper which was accepted for publication, or a work of art or literature which was acclaimed.

The second program, *Lear*, gives a simple demonstration of how a program might create poetry. Even with the small number of words and phrases given in the program there are over 10 million different possible limericks that it can generate. You are very unlikely to see exactly the same limerick twice, however many times you run the program. And if the computer's random numbers were generated from a truly unpredictable process, such as radioactive decay, the program would create a completely unpredictable poem.

The *Lear* program illustrates that there is a lot more to creativity than creating something new. Simply exchanging existing elements randomly should not qualify as creativity. Existing computer programs do not create anything very new, they only search out some favourable possibilities from a fixed set of possibilities.

Understanding language: *Eliza*

The ability to communicate, to generate and understand natural language, is another type of behaviour usually considered as intelligent. This ability forms the basis for Turing's famous test, in which a program is defined as intelligent if it can convince a human user conversing with it via a computer terminal that it is not a computer. The third article presents a version of *Eliza* – a program originally designed to provide a convincing natural-language conversation with a human.

A more sceptical view of Articifial Intelligence is that even if programs, such as those described here, successfully simulate intelligent behaviour in some respect, they are still not intelligent. The idea of the Turing test is that this objection is meaningless because in practice, if you cannot tell the program and the real thing apart, they might as well be the same thing. In other words, the only thing that can possibly count as to whether something is intelligent or not is its behaviour, not how it works or what it is made of. So the criterion for intelligence must be based only on behaviour.

However, behaviour cannot possibly be the only criterion. The best *Eliza* programs can fool average users for quite a long time before they finally realise that they are talking to a computer. And one can imagine a gigantic computer with a huge *Eliza* program containing plausible answers that an intelligent being might give for all possible questions of length less than 10 million characters. The machine would pass the behavioural test of intelligence, but most people would say that such a program is not intelligent.

Consciousness and feelings

What else might intelligence consist of, apart from intelligent behaviour? One could argue that connected with intelligence is the subjective sensation of understanding, or consciousness, or feelings. One could imagine a program which imitates the behaviour of a feeling system, such as complaining if you try to stop it running, but we would be reluctant to say that it had feelings. Just as there is a difference between executing the behaviour corresponding to a certain feeling and experiencing that feeling, so there is a difference between executing the behaviour corresponding to intelligence and actually possessing intelligence.

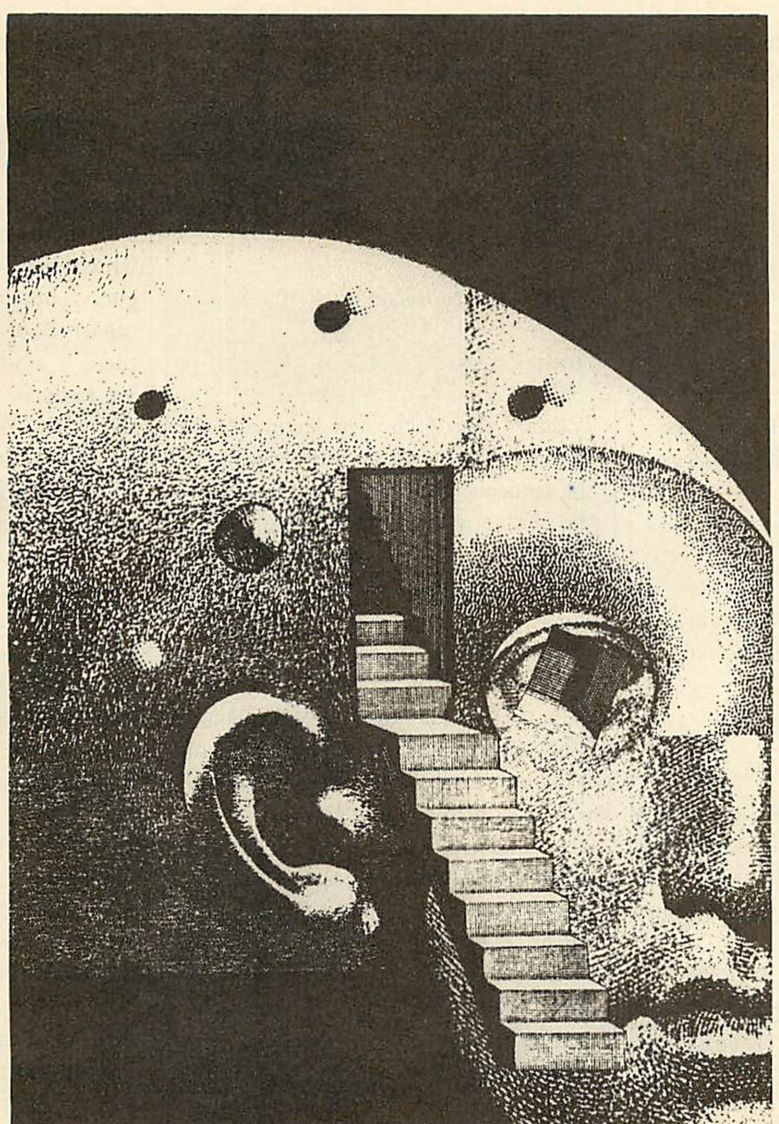
It might be that since we do not understand what it is that gives a thing feelings, some new advance in the theory of computation is needed to distinguish between the kinds of program that can have feelings and the kinds that do not have feelings. In the same way, we probably do not yet understand what is needed to make a program intelligent.

The three examples presented in this feature could all be extended, given more computing power, to attempt to provide more and more convincing demonstrations of problem solving and learning, creativity and natural language generation and understanding. This is the course being followed by the research area of AI. However, it seems implausible that at some particular level of complexity we would accept them as intelligent. There is no evidence that the shortcomings of the simulated intelligence of the programs we have been discussing would be solved simply by making them bigger, faster or more complex.

Philosophers, psychologists and other thinkers have spent centuries considering the source and functioning of the feelings and consciousness which seem fundamental to real intelligence. Until computer scientists can unravel some of the problems that the philosophers and psychologists have faced, and make a radical addition beyond anything we can currently imagine to the functions that machines now possess, it seems unlikely that they will produce a computer program which we would accept as truly intelligent.

The following two books are recommended for further reading on this subject: *The Mind's I*, Hofstadter and Dennett, Penguin Books; *Metamagical Themas*, Douglas R Hofstadter, Viking Press.

David Johnson-Davies is managing director of Human-Computer Interface Limited, a software publishing consultancy. David Deutsch is a theoretical physicist at Oxford University. Rod Nicolson is a lecturer in psychology at Sheffield University, researching into Artificial Intelligence and Computer Aided Learning.



WHAT COMES NEXT?

A program called *Gus* can guess number sequences. The more it does, the better it gets

David Deutsch and David Johnson-Davies

Gus, standing for 'Guess Sequences', is a program which deduces the underlying mathematical rule governing the next number of an integer sequence, given the existing members.

Thus, a typical problem presented to the program might be the first of the sequences on page 82. In this sequence the rule might be that in each case the next term is the sum of the last term and the penultimate term; the next number is therefore eight. The intention in writing *Gus* was not just to create a program that would guess the next member of a sequence, but that would guess the rule that determines the sequence. As an added refinement, *Gus* gives a description of the rule it finds in plain English. It learns from sequences it has guessed correctly in the past, and it can be helped in guessing a difficult sequence by giving it easier related sequences first.

The way that *Gus* works is best illustrated by some examples. The first shows

how *Gus* solves the simple sequence 1,1,2,3,5,? The user types in the first five terms of the sequence:

```
How many terms (at least 4)? 5
term (1) = ?1
term (2) = ?1
term (3) = ?2
term (4) = ?3
term (5) = ?5
Time limit (in seconds) = 100
```

After a short delay *Gus* produces a guess, in English, at the rule governing the sequence, and gives the next term:

```
(p) 0 secs.

I think that each new term is the sum of
the last term and the penultimate term.

That would make the 6th term 8.
Is that correct? y
```

The string (p) displayed above the rule is a more compact statement of the rule which will be explained later in the article. A more difficult example is the second sequence from page 82:

```
How many terms (at least 4)? 5
term (1) = ?2
term (2) = ?6
term (3) = ?30
term (4) = ?210
term (5) = ?2310
Time limit (in seconds) = 100

(nPt) 35 secs.

I think that each new term is the
product of the prime whose position in
the sequence of primes is the number of
the new term with the last term.

That would make the 6th term 30030.

Is that correct? Y

Adding nP

Adding Pt
```

This illustrates that *Gus* knows about certain standard sequences, such as the prime numbers and the factorials. It also demonstrates how *Gus* learns from past successes; this sequence initially takes 35 seconds, but *Gus* having guessed the rule and will now guess the same sequence (or a related one) much more easily and much quicker:

```
How many terms (at least 4)? 5
term (1) = ?2
term (2) = ?6
term (3) = ?30
term (4) = ?210
term (5) = ?2310

Time limit (in seconds) = 100

(nPt) 2 secs.

I think that each new term is the
product of the prime whose position in
the sequence of primes is the number of
the new term with the last term.

That would make the 6th term 30030.

Is that correct? Y
```

Finally, if *Gus* fails to guess a sequence it can be helped, either by giving it a simpler related sequence, or by actually telling it the rule as in this example:

```
How many terms (at least 4)? 5
term (1) = ?1
term (2) = ?8
term (3) = ?77
term (4) = ?766
term (5) = ?7655
Time limit (in seconds) = 60

Continue for another 60 seconds? n

Give me the answer? y
GUSL string = :tnm

Adding :tnm
```

There are several good reasons why the solving of integer sequences was chosen as the problem to be tackled by this AI program. On the practical side, since they are mathematically-derived, integer sequences are amenable to efficient computation. This enabled us to write *Gus* in BBC Basic and still create a program which displays surprisingly intelligent behaviour in a reasonable amount of processing time.

The problem of solving integer sequences is also an interesting one from a theoretical point of view; given a certain number of terms of a sequence, there is no single right answer to what the next term in the sequence should be. A person attempting to guess a sequence would normally choose the one that is, in some sense, the simplest. A notion of simplicity therefore needs to be incorporated into the program to ensure that the computer guesses the rule most likely to have been thought of by a human.

Finally, although the solving of sequences is amenable to computation, it is by no means a trivial and uninteresting task, and there are many types of sequences which humans would find fairly easy to guess, but which are well beyond the capacities of this program. As an example, there is a whole class of sequences which are familiar to us from our experience in the real world, such as: 31, 28, 31, 30, 31, 30, 31... Such 'base sequences' can be added to *Gus* so that it can guess these and sequences derived from them.

The program (see the yellow pages), uses a compact internal language to formulate hypotheses about the sequence that it is trying to guess. The language, which we have called GUSL (*Gus* Language), consists of a sequence of single letter operators. These operators perform operations on a 'stack' of numbers in a way which will be familiar to anyone who has used a Hewlett-Packard calculator, or has programmed in Forth. Numbers are placed onto the top of the stack, and operations are performed on the numbers at the top of the stack. For example, the GUSL string '123' places the numbers one, two and three onto the stack, so that three becomes the top-most stack item. The GUSL operator 'p' (for plus) replaces the top two items on the stack by one item, their sum; the stack will now contain 1, 5:

```
Before:.... stack .... 1  2  3
                top of stack ─┘

After: .... stack .... 1 (2+3)
                top of stack ─┘
```

The full set of operators in the stack-orientated language are listed in the table opposite on page 87:

The operators P and F are slightly unusual in that they replace the top number N on the stack with the nth prime number, and the nth factorial number respectively. For example, if the top number on the stack were 4, P would replace this with seven and F would replace it with 24. These operators enable *Gus* to formulate rules involving primes or factorials. Finally, n pushes onto the stack a number corresponding to the position of the next term in the sequence, counting the first term as one, the second as two and so on.

This set of stack-orientated operators was chosen as being the smallest set that would conveniently describe most common mathe-

The following table gives the time taken by 'GUS' to deduce the rule for some of the examples given in the text. All the timings are those given by GUS, and were done with no previous knowledge, that is without the file called 'DATA' on the disc.

		Times (seconds)			
Sequence	Rules	Model B	B + 2nd proc.	Master	Electron
1 1 2 3 5	p	0	0	0	0
1 1 4 10 28	p2t	96	64	81	143
2 6 30 210 2310	nPt	85	57	72	127

Figure 1. Time taken by *Gus* to deduce rules for examples in text

Operator	Description	Operation before → after
p	plus	a b → (a+b)
m	minus	a b → (a−b)
t	times	a b → (a*b)
d	divide	a b → (a DIV b)
e	exponentiate	a b → (a ^ b)
w	swap	a b → b a
c	copy	a → a a
o	pop	a b → a
1	1	a → a 1
2	2	a → a 2
3	3	a → a 3
4	4	a → a 4
5	5	a → a 5
:	10	a → a 10
P	Prime	n → (nth Prime)
F	Factorial	n → (nth Factorial)
n	number	a → a (number of term)

Table 1. The full set of operators is the stack-orientated language

First few terms of sequence	GUSL rule for generating
(a) 1, 2, 4, 8, 16 . . .	2t
(b) 1, 1, 4, 10, 28 . . .	p2t
(c) 2, 6, 30, 210, 2310 . . .	nPt
(d) 1, 8, 77, 766, 7655 . . .	:tnm
(e) 99, 96, 91, 84, 75 . . .	:2en2em

Table 2. The sequences in figure 1 and their GUSL representations

matical sequences. Furthermore, they were designed so that in general simpler sequences would have shorter representations in the notation. It is quite intentional that only the numbers one to five and 10 are represented in the language. Other numbers can be constructed if needed: six is simply '51p'.

Table 2 shows some sample sequences and the GUSL rule that will generate any term in the sequence, if the previous terms are pushed onto the stack. These examples illustrate how compactly the notation deals with both sequences in which each term is most simply expressed as a function of the previous term, as in (a) and (b), and sequences in which each term is best expressed as a function of its position in the sequence, as in (c) and (d).

Of course, many GUSL rules may give the same sequence. For example, 'cp' and '2ne' are both equivalent rules for sequence (a), and the last example (e) has a more compact GUSL representation – can you find it? However, each rule unambiguously defines one sequence, and apart from some relatively rare exceptions (such as '11md') every GUSL string is syntactically valid and worth considering as a rule. Also, GUSL 'programs' cannot get stuck in loops. These two last points make GUSL an easier language than, for example BBC Basic for generating rules about sequences.

Executing a rule

The *Gus* stack-operation language is executed by the routine FNrun in lines 700 to 810. This takes a GUSL string containing the stack operators, and executes them on the numbers currently on the stack. The routine leaves any results on the stack, and returns a code to indicate successful evaluation, underflow (if there were not enough numbers on the stack for the operations), or error (if, for example, there was an attempt to divide by zero). The routine FNrun works by taking the single-character operators from the string one by one; if the character is between '0' and '@' (line 790) a number between zero and 16 is pushed onto the stack (for example ':' represents 10). Other characters x cause a routine FNx to be evaluated, by taking advantage of BBC Basic's EVAL facility. This provides a particularly neat way of implementing the operators, without the need for multiple tests and branches. Also, new operators can be added to the language extremely simply by defining a new function to perform the appropriate operation on the stack; this is explained in greater detail below.

As an example, look at the definition for the 'plus' operation, FNp in lines 830 to 860. This returns minus one on stack underflow (line 840); alternatively it adds together the two values on the top of the stack s(sp−1) and s(sp), and decrements sp, the stack pointer since there is now one less number on the stack. The routine returns zero (success), or one (error) if the greatest integer has been exceeded (line 860).

Formulating hypotheses

Gus generates hypotheses, and tests them against the human's sequence until one proves to work perfectly, predicting each term from the earlier terms in the sequence. The hypothesis generation is perhaps the most difficult part of an AI program to write successfully, and this part of *Gus* could most usefully be extended to improve the program's performance.

Currently, the program begins with the standard GUSL operators as its only hypotheses. It generates new hypotheses by appending these together, first in pairs, then in triplets, and so on, thus generating all possible sequences of stack operations in

order of length. However, the program contains an important characteristic that greatly improves its performance. In fact it learns from its past successes. If it correctly guesses a sequence, the routine PROCremember (lines 2420 to 2480) adds the subsequences making up that sequence to the list of standard sequences it knows about. Its knowledge about new sequences is saved in a file called DATA on exiting from the program (lines 140 to 190), and loaded in when the program is next run (lines 600 to 640).

As an example, consider the starting position, where the standard sequences are just the single-character stack operators. Giving the program the sequence 1,1,4,10,28,76 results in the following:

```
How many terms (at least 4)? 5
term (1) = ?1
term (2) = ?1
term (3) = ?4
term (4) = ?10
term (5) = ?28
Time limit (in seconds) = 100

(p2t) 39 secs.

I think that each new term is the product
of two with the sum of the last term and
the penultimate term.

That would make the 6th term 76.

Is that correct? y

Adding p2

Adding 2t
```

Gus guesses p2t, which is correct (add the last two terms, and double it), and so the subsequences p2 and 2t are added to the program's list of sequences. If the same sequence is given again, the program will guess it in a much shorter time, since now it has to append two rather than three standard sequences. Furthermore it will now be predisposed to guessing similar sequences, with a '2t' doubling element, or a 'p2' add two element.

The hypothesis generation is performed by FNcombine(n) (lines 2010 to 2070) which gives all possible combinations of 'n' of the standard strings. This is called from the main routine PROCmain with successively larger values of 'n' (lines 1600 to 1640) until a hypothesis is generated that correctly gives the human's sequence.

As an optimisation measure, certain pairs of stack operators are eliminated during the generation of new hypotheses by FNnext (line 2090). Pairs are eliminated as being nonsense (eg, '1o' which puts '1' on the stack and then throws it away), not useful (eg, '1t' which does nothing) or redundant: for example, 'ct' is elminated because it is equivalent to '2e', but gives rise to a less desirable verbal description. The illegal combinations are stored in a matrix pair (x,y), and any hypothesis containing such a pair is immediately rejected.

Testing hypotheses

Each hypothesis is tested as follows. First, the program tests whether the rule correctly predicts the last term in the given sequence from the previous ones. If not, the hypotheses is refuted and another is tried. If it does, the program tests whether the rule generates the penultimate term from the ones before that, and so on. This process is repeated until the rule asks for elements of the sequence prior to the ones that were given, signalled in implementation terms by stack underflow. A rule is not considered to be corroborated, or a candidate for being the right answer, unless it predicts at least the last element before stack underflow occurs.

In the program this works as follows: the program's hypotheses, in the form of a GUSL string a$ of stack operations, are tested by the routine FNconsistent in lines 1910 to 1990. This first copies all but the last term of the sequence to the stack (line 1960) by calling FNcopy, and executes FNrun (a$) on the stack. If the result left on top of the stack matches the last term in the sequence, the hypothesis remains tenable. The routine then repeats the procedure to make sure that the same hypothesis generates each earlier term from the terms before it in the sequence. This test is repeated until FNrun gives underflow or an error, or fails to generate the next term in the sequence, or all the terms are used up (line 1990).

Natural language output

The section of the program from line 2610 onwards is concerned with giving an English language explanation of the final rule. Although this natural language output routine is a totally separate part of the program from the hypothesis-generating and testing, it provides interesting challenges in its own right, and makes the program far more rewarding to human onlookers, avoiding the need for users of the program to understand the GUSL notation.

The main procedure, PROCsay (lines 2610 to 2680 works by calling PROCerun ('e' for English output) on the GUSL string defining the rule, gus$. This in turn calls routines for each operator, in the same way as PROCrun, described above. Thus FNep (lines 2990 to 3040) handles 'plus' by outputting the text 'the sum of', followed by calls to PROCerun to print the two arguments separated by 'and'. The parameter 'silent' passed to each routine can be set to TRUE to allow arguments to be read without being printed; for example pop (FNeo lines 3770 to 3800) just throws away one argument and prints the next one.

Adding new operators

New operators can very simply be added to the *Gus* language, to make it easier for *Gus* to formulate hypotheses about different classes of sequences. To add a new operator, for example 'x':

1 Add the character 'x', and its name, to the DATA statement on line 3880.

2 Define a function FNx, which performs the required operation on the stack array, and defines the error conditions. The simplest way to do this is to look at the existing definition of a similar operator.

3 Define the English language output function FNex, which should call PROCerun for its arguments, and output the verbal description of the operation.

Extending *Gus*

An interesting question is: how far can *Gus* go? In practice it has difficulties with some series which look simple, but cannot be expressed in a short *Gus* Language string: for example:

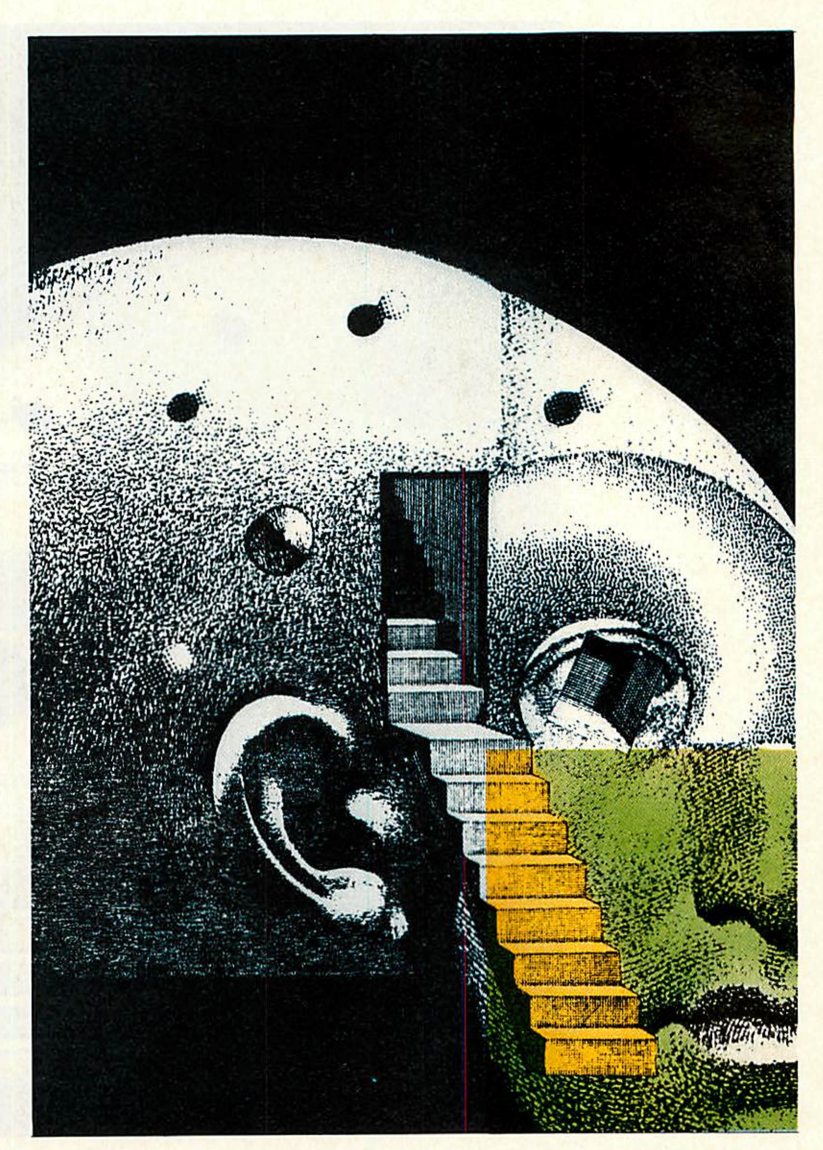
1, 22, 333, 4444, 55555 . . .

However, it is clear that *Gus* could be led in stages to solve this, or even harder sequences. Given an unlimited amount of time, could *Gus* solve any mathematical sequence using the existing operators? Or are there sequences that could only be solved with the addition of certain new operators?

Earlier it was stated that the advantages of *Gus* over other languages, and the reason why GUSL was invented, is that it is more compact and gives a very high proportion of meaningful statements when compared to meaningless ones.

A further interesting question is whether GUSL is a universal language; is it a language in which general programs can be expressed, or general functions can be defined, like most other computer langauges such as Basic and Lisp?

Turn to the yellow pages index on page 113 for details of where to find the Gus listing and how to enter it.



I SAY, I SAY, I SAY

***Lear* is a program which can write up to 10 million limericks!**

David Johnson-Davies

The program *Lear*, shown on the yellow pages, uses a simple table of words and phrases to generate random limericks. *Lear* stands for 'Limerick Evaluation At Random', and the main purpose of the program is to illustrate how creative writing might be approached using a computer.

Two sample verses generated by the program are given below:

A really old duchess from Spain
Once counted a frog on a train.
She counted so late
That she asked for a plate,
This really old duchess of Spain.

and the second:

A vicious young duchess from Wembley
Once demolished some cakes and felt trembly.
She demolished so quick
That she asked for a brick,
This vicious young duchess of Wembley.

The program ensures that all limericks it generates are syntactically correct by using a template to determine which words may be used for each position in the poem:

A ?adjective1 ?adjective2 ?person from ?place
Once ?did ?object =place/2
=person/2 =did so ?adverb
That =person/2 ?did ?object
This =adjective1 =adjective2 =person of =place.

In this template, a '?' indicates that one word will be selected from a list of words of that type. Thus, adjective1 is the list:

sordid
graceful
wily
vicious
really
sparkling

Certain words and phrases occur in pairs, to ensure that the ends of lines will rhyme:

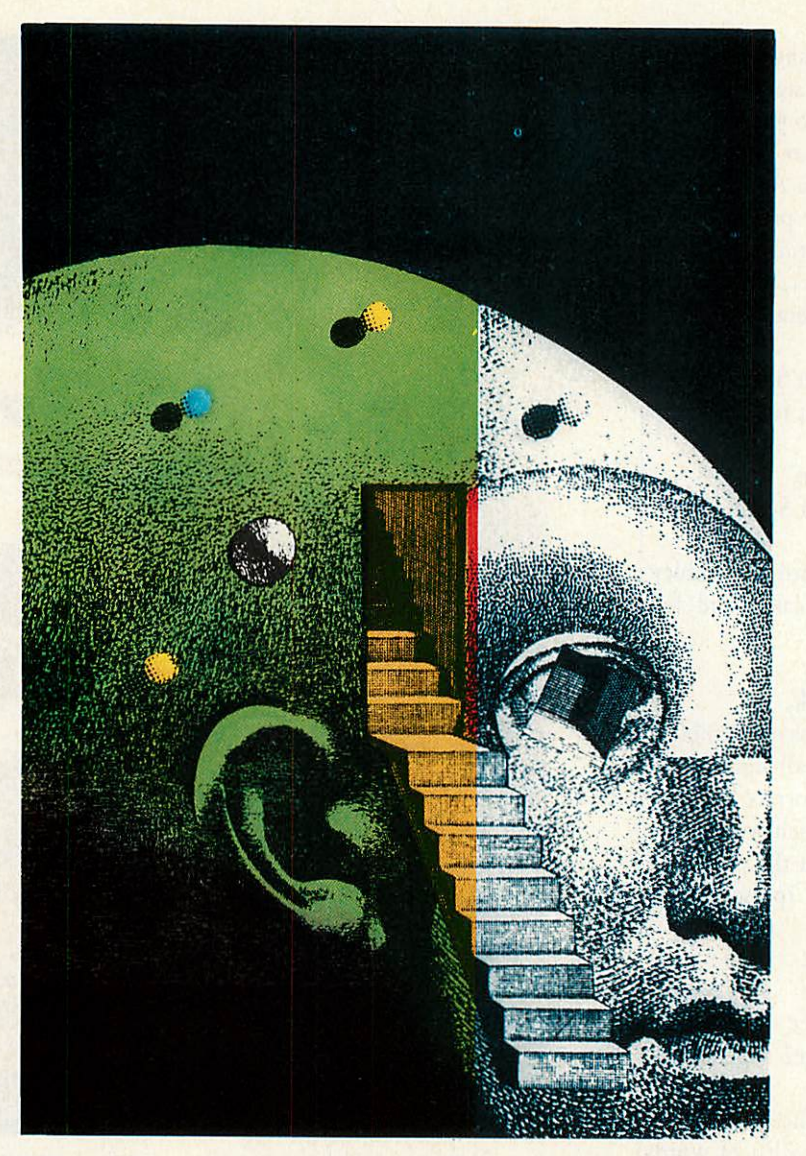
Wembley/and felt trembly
Spain/on a train
Chad/and went mad
Speke/twice a week
Slough/with a cow
France/in a trance

When one member of the pair is chosen for a position in the verse, the corresponding member of the pair is automatically chosen for the other position. For example, the choice of the town ?place at the end of the first line determines the choice for the phrase indicated by =place/2 at the end of line two, and the town is repeated at =place at the end of line five.

The program works by calling PROCword to output a word or phrase at random from a selected data statement. The strings are read directly from the data statements for simplicity, using 'restore' to set the data pointer to the appropriate position. Note that if you renumber the program, the value of L should be altered in line 60 to point to the line number of the first data statement, and the increment in line 470 onwards should correspond to the spacing between line numbers.

Since there are nine positions in the limerick at which a random choice is made between six alternatives, there are a total of 10,077,696 possible limericks!

Turn to the yellow page index on page 113 for the Lear program.



EXPLAIN THAT TO ME

The *Eliza* program mimics two-way conversation. Ask it a question and it will reply.

Rod Nicholson

The English mathematician A M Turing provided one of the most potent challenges yet to Artificial Intelligence (AI) researchers by suggesting back in 1950 that however intelligence is defined, an irrefutable demonstration of artificial intelligence in a computer program would be if a human communicating with the program via a keyboard was not able to decide whether or not he or she was talking to a person or a computer.

Despite immense research, the analysis and creation of natural language dialogues necessary to pass the Turing test still proves an intractable problem for AI researchers. Impressive progress has been made in restricted domains, but the background knowledge necessary to be able to hold even a stilted general conversation is so vast that it is still beyond the scope of our biggest and fastest supercomputers – never mind the good old BBC micro! However, using list processing *on the* BBC

micro, we can recreate the spirit of one of the most famous and controversial programs of the Sixties, Weizenbaum's program *Eliza*.

The most famous version of *Eliza* was the doctor program which Weizenbaum wrote to mimic (or parody) the approach of a non-directive therapist. In non-directive therapy the therapist adopts a neutral, passive role, primarily listening to what the patient says and attempting to get them to talk through and thus, hopefully, better understand their problems. One of the key beliefs of the approach was that many problems are caused by family interactions, and a large part of the therapist's prompting was aimed at uncovering any family problems.

Eliza was able to put up quite a convincing simulation of the therapist by searching each input sentence for keywords such as family members, positive and negative feelings, personal pronouns and so on. If it found a keyword it produced a canned response. For instance, if an input word was 'brother', *Eliza* might say 'tell me more about your brother' or 'how well do you get on with your brother?' from a pre-stored set of alternatives. When no key words were found *Eliza* had to bluff, perhaps by rearranging the input sentence, changing I to you and vice versa. It might change 'my brother made me come' to 'why do you say your brother made you come?' Alternatively, it might try to guide the conversation back to safer topics by such ploys as 'tell me about your family' or referring to an earlier remark made in conversation.

Eliza was, of course, a complete fraud (as was the original Eliza Doolittle, who was taught by Henry Higgins to mimic the manners of aristocracy in Shaw's play *Pygmalion*). It had no understanidng of the conversation and it would only appear plausible as long as the user co-operated. In trials however, it appeared very popular with users – Weizenbaum's secretary talked to it for hours. She even asked him to leave the room while she was in session! So successful was it that K M Colby suggested that such programs could be used to alleviate psychiatrists' pressure of work and even created a program *Parry* which pretended to be a paranoid patient and fooled a panel of real psychiatrists.

A feel for the spurious plausibility of Eliza is given by this apocryphal story of the night that Weizenbaum left *Eliza* running on the company mainframe, and a vice-president tried to log on to the machine from a terminal at his home under the impression he was talking to Weizenbaum:

VP: **Do you think that I can use the computer this morning?**
Eliza: *Why do you ask?* [Routine response to any question]
VP: **I might be able to make some additional Telcomp sales.**
Eliza: *Why aren't you sure?* [triggered by the 'I might']
VP: **My prospective customers have never seen a demonstration of the system.**
Eliza: *Does this mean very much to you?* [routine reponse]
VP: **This is ridiculous**
Eliza: *What do you mean this is ridiculous?* [bluff – restate]
VP: **Is there any reason why I can't use the computer now?**
Eliza: *Tell me more about your prospective customers.* [bluff – refer back]
VP: **Please dial me up on 491 1850**

Having failed to gain any satisfaction via the teletype the vice-president phoned up the sleeping Weizenbaum and the following conversation ensued:

VP: **Why are you being so snotty to me?**
Weizenbaum: *What do you mean why I am I being so snotty to you?*

The remainder of the conversation has been lost to posterity.

We cannot expect to implement a full *Eliza* in 32k with BBC Basic, but even so you can make a passable imitation. The responses made by *Eliza* depend upon a random sequence, and so it is not possible to predict what responses it will give.

The basis of the program is a general-purpose list-processing package, written in BBC Basic, which could also be used for other applications of this type.

List processing

I first started using a list notation when, as secretary of a tennis club, I wanted to be able to create a database of members which could be used flexibly for mailing labels, membership lists and the like. I decided to use a Basic string for each member, a typical entry being:

/McEnroe, J P/Mr/Full member/#M15/, "Centre Court", Wimbledon Drive, Sheffield, S11 7PS/99999/

being in the form /name/title/status/identifier/address/phone no/

The slash sign is a 'field separator', separating the six different elements in the list. The advantage was the complete flexibility of the format. For instance, if the player had no phone number, the string was just terminated with '//'. Furthermore, it is very easy to add another element to each entry – if we wanted a subscription paid entry we could just tack it on at the end. Notice also that by using a different separator one can embed lists within lists – for instance, the address entry is also a list with separator ',' and four elements.

One major use of list processing is the solution of arguably the most serious deficiency of the Basic language – the inability to return more than one value from a function call. Essentially the trick is as follows: if one wants to return four values from a function, first turn them into a list and return the list as the function's value. The list may then be unpacked within the calling routine. I have used list processing in a wide range of applications such as graphics, eg, to return both X and Y values of a specified co-ordinate or to maintain the X and Y co-ordinates of opposite corners of the current graphics window, robotics have also used it to store the Logo style movements of the BBC Buggy and computer based training.

Not surprisingly, list processing really comes into its own for AI applications. After all Lisp, the major AI language of the Sixties/Seventies, stands for 'list processing language'. Of course Lisp is very much more powerful than BBC Basic, being extensible, fully recursive, and makes no distinction between programs and data. Nonetheless, at the heart of Lisp are the functions 'CAR' and 'CDR'. These respectively mean the first element or head of a list and the list minus its head (the 'tail'). We can do that quite easily in BBC Basic! The idea is to define a list as a string which has the same character (normally a non-alphanumeric like / , ; : $ or even " ") as first and last element (call that the separator). The elements of the list are thus the strings between each separator. For instance the string '#hello#goodbye# farewell#' is a valid list with separator # and three elements 'hello', 'goodbye' and 'farewell' respectively. The string '#hello#goodbye# farewell' is not valid because the first and last characters are not the same. In order to do list processing we need to be able to unpack a list into its component elements and store the elements in some string array. For example, the array could be called L$() and allow up to say 15 elements.

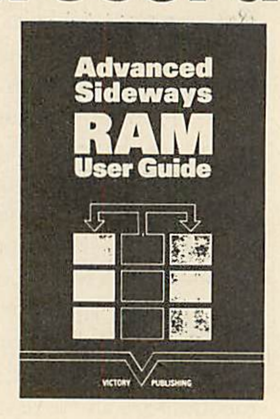
List processing functions

FN_list(list$) Checks for a valid list. Returns one if list$ is a list (ie, first and last elements are equal), otherwise returns a

RAM GUIDE

AU OFFER

Bruce Smith's RAM User Guide



Sideways RAM is a technique central to the new Acorn Master series of computers. It allows you to load in software from disc or cassette which is designed to behave as if it were part of the machine, and is always on tap to the user.

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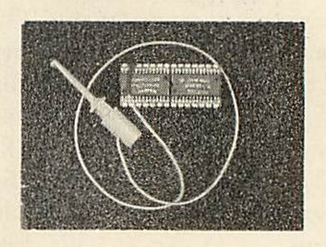
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zero; eg, FN_list ("goodbye/") = 0 and FN_list ("/goodbye/") = 1.

FN_unlist(list$) Unpacks a list into an array. Returns the number of elements in the list, and sets L$(1) to the first element, L$(2) to the second and so on, FN_unlist ("/hello/goodbye/") = 2 and L$(1) = "hello", L$ (2) = "goodbye".

FN_enlist(max%, sep$) Makes a list from an array. Takes elements in array L$ () and turns them into a list with separator sep$, eg, if L$(1) = "hello", L$(2) = "goodbye", L$(3) = "Eliza" then FN_enlist (2, "#") = "#hello#goodbye#").

FN_head(list$) Returns the first element (head) of a list eg, FN_head ("#hello#goodbye#") = "hello".

FN_tail(list$) Returns a list comprising all but the first element (the tail), eg, FN_tail("#hello#goodbye#") = "#goodbye#".

FN_member(item$, list$) Checks whether an item is in a list. Returns zero if item$ is not a member of list$, otherwise returns its first occurrence within the list, eg, returns two if item$ is the second element. Note: changes contents of L$ (), for example, FN_member("goodbye", "#hello#goodbye#") = 2., FN_member ("good", "#hello#good bye#") = 0.

FN_add_element (element$, list$) Appends a new element at start of an existing list. Returns a list comprising the element element$ added to the front of the list list$, eg, FN_add_element ("hello", "/dolly/") = "/hello/dolly/".

FN_add_lists (list1$, list2$) Appends all elements of two lists. Returns a list comprising first the elements of list1$, then the elements of list2$, normally with list2$'s separator. Note: changes values of L$ (), eg, FN_add_list ("/hello/goodbye/Eliza/", "#farewell#") = "#hello#goodbye# Eliza#farewell#".

FN_intersection(list1$, list2$) Returns a list containing only those elements common to both lists. The order in the result corresponds to that of list1$. The list separator is that of list2$. Note: changes values of L$ (), eg, FN_intersection ("/hello/goodbye/Eliza/hello/", "#farewell# hello#Eliza#") = "#hello#Eliza#hello#".

A full listing of the list-processing package is given in listing 1 on the yellow pages. The routines are labelled from 31000 onwards to allow them to be spooled to disc. Note almost all the variables used are local to the routines, the only global one being the array L$(). Incidentally the convention is used to distinguish global variables by an initial capital. Notice there are several limitations. The maximum length of any list is 255 characters. Each element must be a string, so numbers must be converted using STR$ and VAL, and the maximum number of elements is decided by the dimensioning of array L$(). However, the most annoying failing is since you can't pass an array to a function or declare an array as local in BBC Basic, the array L$() is defined globally and so an operation such as FN_unlist will change the values stored in L$ (). In fact the following operations alter L$ (): FN_unlist, FN_member, FN_add_lists and FN_intersection, so be careful!

BBC Basic *Eliza* program

The *Eliza* program is given in listing 2 of the yellow pages; to this should be added the list processing routines of listing 1. The main program outline is clear (see lines 60 to 210). The program prompts for input, tidies up the input string by eliminating any non-alphabetic characters and any multiple spaces, and codes the tidied string as a list of words with separator " ". This input list is then changed into the default output list by changing "I" for "you", "you" for "me" and so on. The set of words to exchange is stored in the list Exchange$ – see PROC_setup_prog.

Following a check for situations such as a null input, one word input, rude input (see the list Rude$ in PROC_setup_prog) and "hello"/"goodbye" (via the list Greetings$), the default output list is scanned for key words in various categories. Any words matched are stored in the list match$. Depending on the success of this matching process a corresponding output list is generated and output to the user. Any key words in the input are added to the list Mentioned$ for use as a potential subsequent bluff. In order to allow the user to see through *Eliza*'s strategy I have introduced the global variable Trace to report the output procedure. Set Trace=1 in PROC_setup_prog to turn it on.

Incidentally, you may be interested in the routine PROC_print which was written to demonstrate the uses of list processing for relatively mundane tasks. PROC_print ensures words on the screen are not split at the edge of the screen.

Probably the most interesting part of the program came as an afterthought. In my original version the final output from FN_match came as a text string which was passed directly to PROC_print. However, the earlier version seemed pretty dumb in that, having made a statement it made no use of it. This was particularly obvious when *Eliza* asked a question and the user answered just yes or no. In which case *Eliza* just had to bluff, whereas it would have been much better if *Eliza* had some plausible continuation worked out for such an obvious reply. This was achieved by allowing a list of two elements to be returned from FN_transform (or FN_match). The head of the list is the current output text, as before, and the second element gives an appropriate plausible continuation. For instance, the routine FN_family may return "/Do you have a large family/Who is the closest to you?/", leads to the following:

Eliza: *Do you have a large family?*
User: Yes
Eliza: *Who is the closest to you?*

It is possible to engineer greater responsiveness by returning lists of three or more items, so that *Eliza* could give different responses depending on whether the answer was yes, no, maybe and so on. Just this single potential continuation makes a surprising difference to the continuity and hence plausibility of the conversation.

Suggested enhancements

You will find the *Eliza* given is not all that convincing, primarily because most computer hackers don't want family-oriented non-directive therapy and so *Eliza*'s only strength is rather misplaced. Some progress can be made by increasing the scope of the key words or by cheating. It is quite possible to do limited parsing using list processing, but it is necessary to know which words are verbs, nouns, pronouns, determiners, adjectives and so on. Perhaps school or office politics or gossip is your forte. You might try the computer bluffer approach, key words being makes of computer and jargon like RAM, Mbytes, WIMP, 68029 chip. Probably the meanest thing you could try would be the computer malfunction. Use your standard Acorn banner and the prompt '›'. One can easily envisage the following dialogue:

›LOAD "PROG"
Syntax error
›LOAD "PROG"
›**CAT*
›*DRIVE 2
Do you really want to load this program?
This program could lose you an awful lot of friends!

Turn to the yellow index on page 113 for details of the Eliza programs.

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EXAMPLE OF MFNLQ FONTS

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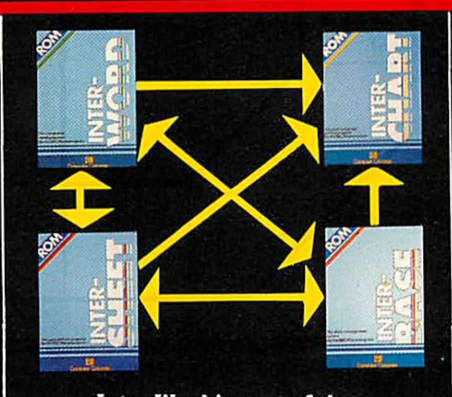
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THE NAME OF THE GAME

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Joe Telford

Somewhere in my slumbers I heard a noise. I hid under the bedclothes but the noise continued. 'Dad, Dad, Daddy!' I forced an encrusted eyelid open. 'See Dad, I knew you were awake. I've just been over to see Claire, and she got a Tribial Fur Suits game for Christmas.' The semi-functional optic rotated, focussed and examined the clock: 6.30am. Why do all British children live on a Continental timescale? 'Dad, can we have Tribial Fur Suits, its quite good, really good really, but the questions are too hard, can we, Dad?' I pretended to fall asleep.

Breakfast arrived and the beginnings of really deep trivia were clearly indicated. 'Dad, did you know we eat about 100 loaves of bread every year, each I mean? Did you know that Dad?' I didn't, nor did I know the core temperature of the sun (though I did once), and nor did I know how many bones were in the average human foot. The tirade continued and I realised I was faced with three options. I could buy a Tribial Fur Suits game, a mere snip at £21, or I could program the robot arm to smack the children's bottoms. Alternatively I might design a suitable game for the BBC micro.

I grabbed a notepad, pencil, coffee, daughter and retired to the laboratory. The first task was to analyse the game. Kathryn explained the sort of activity which went on. The major elements then were: board, dice, counters, trophies to collect and questions and answers.

Each of the above could, I thought, be designed on a computer screen. I envisaged some problems, especially the lack of memory. The program would also have to be compatible with run on the following micros: B+, Master and Electron.

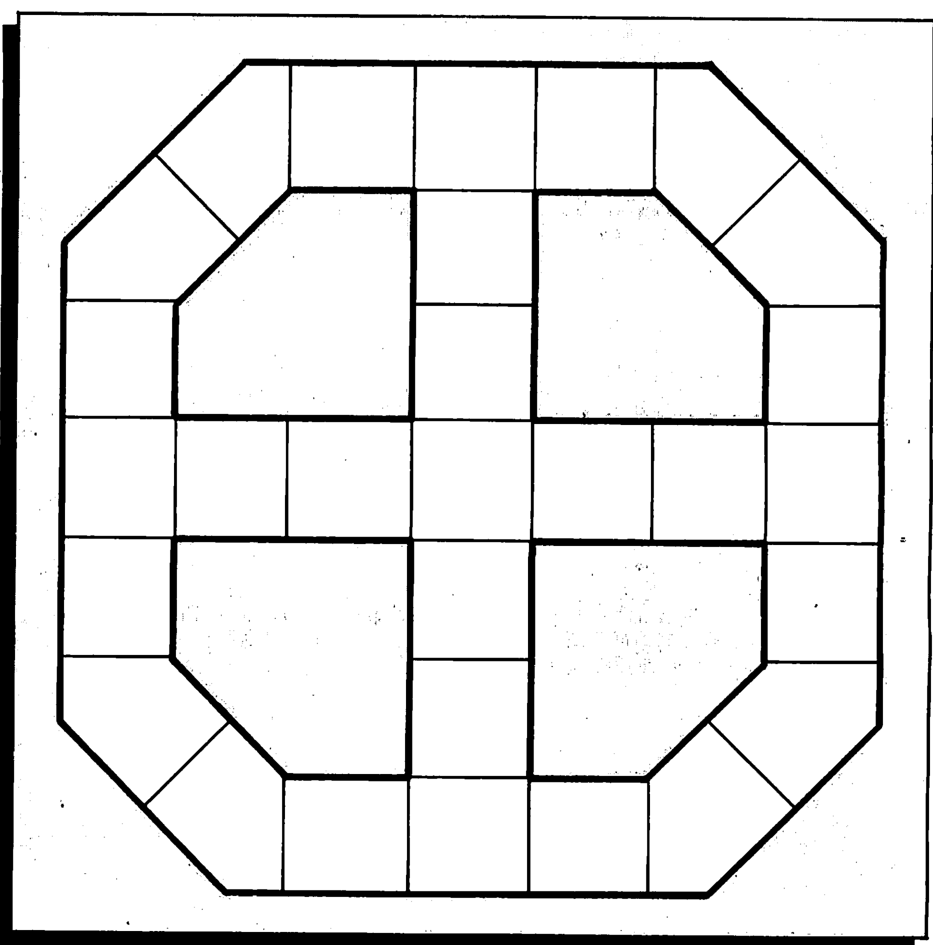


Figure 1. Conventional board design

The board

Figure 1 represents one possible board. The purchase of a number of trivia books indicated that as the focus of the game was in answering questions, the board shape didn't really matter. In terms of computing, however, the analysis of movements on a games board was quite important, because it would dictate a fundamental way in which the user would interface with the game. The basic problem with the type of game boards shown in figure 1 is they are not easily modelled on the computer. Once modelled, they are difficult to traverse.

The resulting board was the one shown in figure two. It measures seven squares across by four deep, and each horizontal row contains the seven key colours available on the BBC micro.

- A player's piece travels in a straight line until it covers the number of squares indicated by the dice, or until it reaches the edge of the board.
- When it reaches an edge of the board it

reflects just like a mirror, except that the number of squares still to cover is taken into account.

Figure two shows a typical complex move based on throwing a six.

If the choice is made to go for a coloured board, and the associated collection of coloured trophies, the choices of screen mode are reduced to three:

1. Mode 5 – 4 colours/3 trophies. Good memory
2. Mode 1 – 4 colours/3 trophies. Poor memory
3. Mode 2 – 16 colours/6 trophies. Poor memory

I decided to work within the constraints of mode 2, though Master and B+ users can have the ecstasy of mode 130. The benefit of mode 2 meant that the board could be printed in seven flashing colours which would be set to give different effects depending on the level of play:

- Level one. Full board visible, seven colours visible
- Level two. Colours only visible when a piece crosses one or lands on it.
- Level three. Board colours invisible, and must be inferred by the colour of each player's piece.

Children find level one acceptable but struggle with level two.

Counters, trophies and the dice

The dice is quite simple and straightforward to create (figure 3). The numbers associated with each face of the dice are the user defined character set. One problem which we faced immediately was that a single character seemed a trifle squashed because of the character aspect ratio in mode 2. The solution was to develop a printing routine which gave double height characters. The single character dice was then expanded to a very readable size. The next problem was throwing the dice and this was accomplished with a routine based on the following:

```
FOR roll = 1 TO 20
dice=RND (6)
NEXT roll
```

but this was made much more exciting by making the number of rolls in a throw a variable number between 20 and 50. The dice was also set to click as it rolled, and each face which turned over appears on screen briefly. The whole throw is started by simply pressing D.

Because it is important for each player to recognise her/his turn they each type in their names and are allocated a number in order of names entered. These numbers act as counters and move across the board. Up to four players can play the game at any one time, each taking one go.

In order to initiate the movements of the counters around the board, the direction of the current piece must be set. This is done by tapping the R key when the dice has stopped. The R key changes into an arrow which rotates. The character set is shown in figure 4.

The aim of the game is to collect these trophies. Figure 5 shows a prototype character which users can alter to make their own trophy. Remember to use CHR$132.

Questions and answers

This is the tedious part of the game. Questions pose two problems to the would be games writer. The first is simply, the aquisition of useful questions. Serious users should generate their own questions from an encyclopedia, or games book. The next major problem is in fitting questions into the available memory. This in mode 2 is frighteningly difficult, as memory is very tight indeed. The most successful program was one where the questions for each coloured square were saved on disc as files, hence a red file, a green file, a yellow file and so on.

There were four alternative solutions, depending on what micro was available. All required the use of two programs, a header to set up the games board, and a playing program to play the game. The alternatives were as follows:

- Core program reading questions and answers from disc files. (BBC micro/B+/Master/Compact with discs)
- Core program with questions and answers in data satements (B+/Master/Compact with discs/cassette)
- Core program with questions only (Electron with discs/cassette)
- Core program with questions plus possibly answers (Electron with cassette)

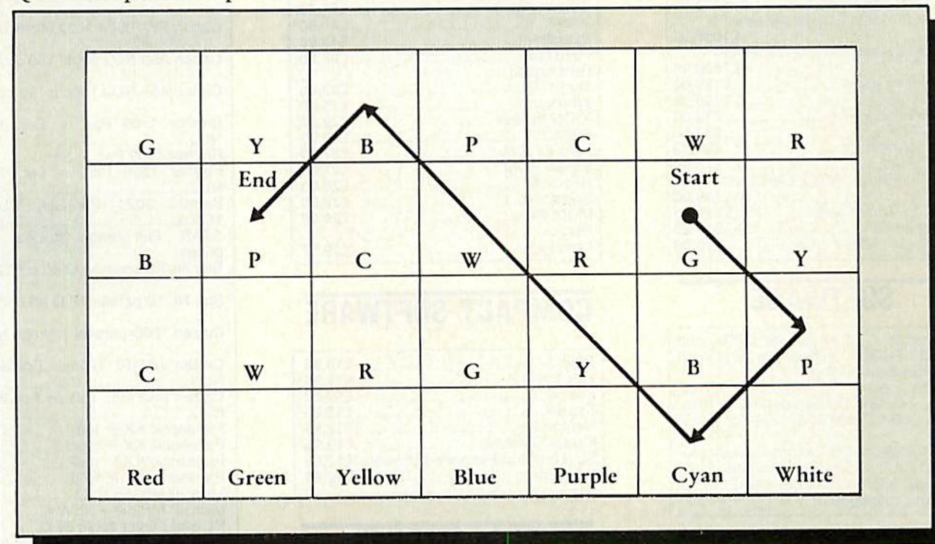
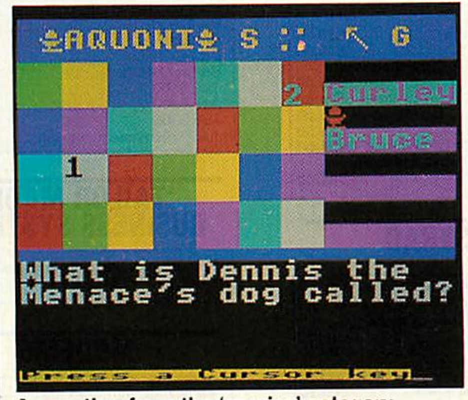
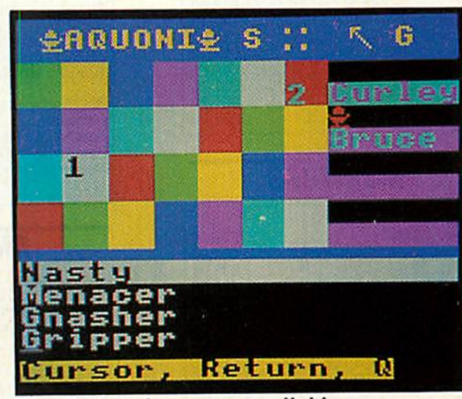


Figure 2. Board design for the computer game



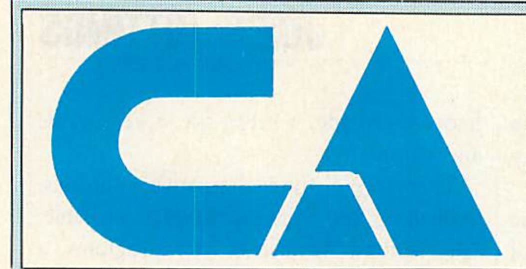
A question from the 'comics' category



The choice of answers available

While the first three are shown as example programs, based around a common core, the last program has only been specified in outline.

At first sight the idea of having questions without answers seems crazy. However, it is a sure way of reducing memory requirements. The idea is to rely on the other players to enforce the honesty of the game by first asking the question then asking,



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did you guess correctly? It works well, provided everyone knows the answer.

The previous approach resolves a very complex problem. How do you phrase questions on a computer, to get an answer which is capable of being interpreted by the computer. Consider the question: *What have Princess Anne and Dr Spock in common?* A typed answer could take almost any format!

The alternative to coding answers is to present a number of alternatives and let the user choose. The benefits of such an approach are no typing, hence no spelling and coding problems. Also there is a guaranteed chance of being correct.

The best solution is to go for four alternative answers each of a maximum of 20 characters, and a single digit indicating the correct answer. Practice with 100 random questions showed most questions could be phrased within 80 characters.

In the final solution, each question and answer is placed on disc in a file with a set record length of 200 characters. This was sufficient to take the question, answers and correct answer number, plus the few extra bytes overhead needed. The first record is simply the number of records in the file, and any record can be reached with a simple routine like:

```
ch=OPENIN ("RED")
INPUT#ch, records
PTR#ch=RND (records) *200
INPUT#ch, question$
FOR x= 1 TO 4
:INPUT#ch,an$(x):NEXT
INPUT#ch, correct
CLOSE#ch
```

Which for the record is random access filing. The file layout is shown in figure 6.

Play the game

So lets play *Aquoni*. If you haven't already guessed, *Aquoni*, pronounced 'acorny' means 'a question of no importance' because someone somewhere will have copyright on 'Tribial Fur Suits'. Imagine that you have your disc set up with the header program, Main program and data-files. Chain "AQUONI" and the title screen will appear. Soon you will be asked on which level you wish to play.. Press 0, 1 or 2 and then Return. If you don't press Return, then after a few seconds the program moves on anyway.

Now you're asked for the players names. Type each name in turn (up to six characters) and press Return. If you wish to play with one, two or three players, press Return by itself on the line after the last name to be entered. At this point the second program is chained, and the information recorded in the first program is passed to it. Once the numbers representing the players appear in the bottom left square, the game is on.

The player to go first is randomly chosen, and the letter D for dice begins flashing, accompanied by a beeping sound. The beeping can be cancelled by pressing S. Press D and the dice will roll and click as it goes. Once the dice stops the letter R will start flashing. Press the R key to display a vertical arrow. Continue pressing until the arrow points in the direction in which you wish to travel. Now press G and your counter will move across the board. When the counter stops, a question will be asked based on the file linked to the square colour. Pressing a cursor key clears this area and shows the four alternative answers. The cursor key can now select an appropriate answer.

When Return has been pressed the answer will be checked and the result shown. Note that incorrect answers do not result in being told the correct answer.

If you land on a white square then you are asked to choose a question colour. This is done by pressing the space bar when the colour required is shown. The displayed colours can be accelerated by tapping Return. Once a colour is selected, a question is asked, and if this is answered correctly a coloured trophy is awarded. The aim is to get all six coloured trophies before anyone else. Once the game is won it can be replayed by pressing Space.

133 134 135 136 137 138

Figure 3. User defined dice

The programs

Listing 1 in the yellow pages is the header program and is needed for all versions of *Aquoni*. Copy it into memory then save it on disc as "AQUONI". If you have a Master, change line 60 to mode 130.

The role of the header program is to set up all user defined characters and the board itself. Notice in line 140 that the name array is copied into memory at page &900. This is an illegal way of transferring string arrays between programs, and this is why the program collapses on a second processor or co-processor.

Major routines

FNSetlevel Lines 190-380 print title page and then ask for level.

PROCscreen Lines 400-690 define all user characters and print the board.

PROCcqa Lines 710-820 clear the lower portion of the screen by scrolling.

FNname Lines 970-1180 print the instructions and then input each name into the name$() array, returns number of players in integer variable N% for transfer to the main program.

Library routines

PROCd Lines 840-890 sends each character in turn of a string to PROCdh for double height printing.

PROCdh Lines 910-950 print any character sent in double height.

FNgpi Lines 1200-1310 an intelligent input routine reading in this instance six character words, capitalising the first letter, and accepting capitals or lower case as valid. Note that the DIM C%9 of line 70 is

necessary for PROCdh as it uses an OSWORD control block.

The template program

Program 2 in yellow pages is an example template for building up your own data files of questions. Remember you will need one template for each colour, six in all. I tend to call them by the colour names, so the template is the 'red' template. To change the name to 'blue' for example alter line 80 to read:

```
80 file$="BLUE"
```

The actual questions and answers start at line 430, and this is the only other area which needs amending. In fact a good deal of thought has to go into this section. Generally speaking, keep one colour to one topic. Also remember that you will end up with six templates and six data files, one for each template. Make sure you label each sensibly.

The main program core

Notice that the program is very heavy with dimensioned lists and arrays. In order:

c%9 Dimensions space for the OSWORD block used by double height commands.

name$(4) A list of up to four names.

p(4,2) Co-ordinate array for each players counter, so p(1,1) = x co-ord for player 1 and p(1,2) = y value for player 1.

colour (4) The colour of the last square landed on.

score (4,6) The trophy score sheet.

an$ (4) List for the four answers.

file$ (6) List of six filenames, file$(1)="RED" and so on. NB this is only used in version three.

The first activity is to initialise the lists and arrays, and this is done in by PROCstartup, from 690 to 730.

Next the names are transferred from page &900 back to the name$ array, and in line 60 we choose the player before the one to go first. The sequence of play is shown in the main program loop of lines 70 to 140. The sequence is:

Line 100. Increment the player pointer (n in line 100).

Line 110. Start that go (PROCgo), then roll the die (FNdice).

Line 120. Select the direction of travel (FNrotate) then move the correct number of squares (PROCmove).

Line 130. Set the question (PROCgiveQ).

Line 140. Increase the score by the result of the answer (FNanswer).

Line 150. Tidy the screen after the go (PROCendgo).

Line 160. Continue until the current player has six trophies.

Figure 4. User defined direction arrow

Once the loop is exited, the winner is displayed by PROCwinner and the program either restarts or can be ended.

Major procedures in the core

PROCwinner Lines 190-250. This procedure clears the question screen, displays the winners' name and waits for the space bar to be pressed to restart the game. Press Break to exit.

PROCmove Lines 260-380. This is quite a complex procedure which uses other procs to sequence the counter movement one square at a time, with sound effects and colour pallette changes.

PROCstep Lines 400-500. This routine increments the board position on the p(x,y) array depending on the direction chosen (dr). Before exiting it calls PROCck.

PROCck Lines 520-690. This is a very tedious routine which encapsulates the rules for the boards' edges. Very simply it has one statement for each direction of travel (four edges, three directions plus four corners and direction equals one 16 statements).

PROCposition Lines 1340-1410. This is the routine which displays the counters and then rubs them out before PROCstep moves them. It is called twice for each number shown on the dice, in PROCmove, once to erase and once to redraw the counter on the new square.

PROCcqa Lines 750-810. This is the expanded cqa routine which now carries messages which are displayed in the top display area generated when the board scrolls down the screen.

PROCrotate Lines 830-960. This is the routine which generates the rotating arrow to select the direction of travel. Notice that line 940 lets the S key toggle the sound variable V.

FNdice Lines 980-1090. This is the routine which rolls the die.

PROCsd Lines 1110-1150. This routines draws a set string on the screen and is accompanied by sound and a short delay. Read the parameter line to see what is transferred to the routine.

PROCgo Lines 1170-1200. This routine highlights the new players name.

PROCendgo Lines 1220-1250. This returns the players name to normal print.

FNname Lines 1270-1320. Here we read the names stored in page &900 using the number of names stored in N%.

PROCd Lines 1430-1490. This routine is a speeded up version of the two procs PROCd and PROCdh in the header program.

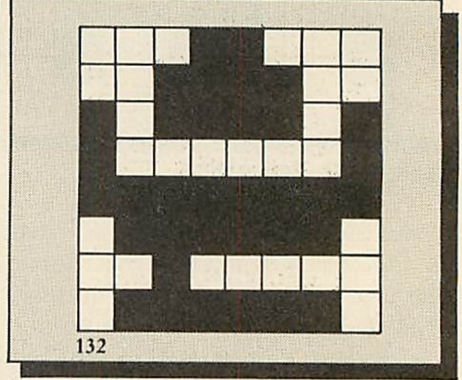


Figure 5. The trophy to collect

PROCprq Lines 1510-1600. This routine prints the question in double height. It calls FNgetword, and also organises word wrap.

FNgetword Lines 1620-1700. This takes each word in turn from the question string qu$ and returns it to PROCprq.

PROCwrong Line 1730. This indicates that the answer was wrong.

FNwelldone Lines 1760-1790 This indicates that the answer was correct and returns a score depending on whether the

correct answer was in response to a white square or not.

PROCupscore Lines 1810-1860. This procedure displays each player's trophies.

FNchoosecol Lines 1880-1990. This function cycles through all the trophy/question colours in a bar on screen and returns number which matches the colour displayed when the space bar is pressed.

Extra disc filing routines

Line 2020 contains the names of the data files previously created via the template programs. These can be altered at suit new datafiles, and readers are left to consider how this program might be used on an Econet, where a large number of files could be created. This is used in PROCstartup, earlier in the program. Other versions of the main program alter PROCstartup, to lose this feature.

PROCgiveQ Lines 2040-2090. This routine checks the square colour and asks for user input if a white square is found. The appropriate file is then opened, at line 2060, and the question, answers, and correct answer are read. The file is then closed. This is ideal for expansion to Econet, but error trapping might be required, if the files are open to multiple users.

FNanswer Lines 2110-2260. This is the main routine which checks the answer selected with the cursor keys. Once Return is pressed, the answer chosen is tested and processed to see if it is correct.

PROCprintans Lines 2280-2330. This procedure prints the four answers and highlights the currently selected one. This procedure uses PROCd and is the slowest procedure in the game.

Minimal version

This was designed as an attempt at Electron compatibility. Although it works, please regard it as a last measure. Let's assume that you have entered the main program (program three in the yellow pages). The next stage is to delete all lines after 2010, and then continue typing in program four.

Notice that it will rewrite lines 10,60, and 710-740. After 2020, the program uses the familiar PROCgiveQ, FNanswer, and PROCprintans, but they are amended to make use of the data statements tagged on to it.

The two major changes are first that filing is replaced with data statement handling in PROCgiveQ. Second, FNanswer now handles two alternatives, preset in line 2110 (remember the spaces). These are 'I was right' and 'I was wrong'.

Data structure

The data can be extended to fit the memory available, but must follow the following format:

Line 2360 A data statement with six numbers, indicating the start of blocks of data for each of the question colours. As you extend each block of questions, the following start lines for data will increase. This must be reflected in line 2360.

Line 2390 The first data block. The first item of data is the number of questions in this block.

Line 2410 The first question. NB no commas allowed.

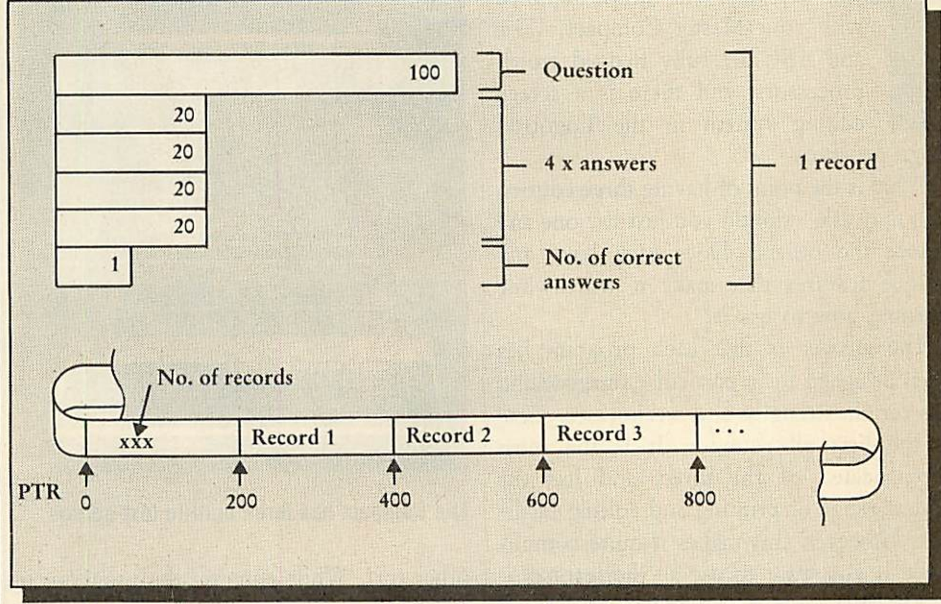


Figure 6. Top, allocation of memory. Bottom layout of serial files

Line 2430 Question two.
Line 2490 Question three.
Line 2540 Question four.
Line 2560 Question five.

The other five blocks will follow this format but with different line numbers.

Master version

The Master version of *Aquoni* was designed for those users with Masters but without disc drives. Let's again assume that you have entered the main (program three in the yellow pages). The next stage is to delete all lines after 2010, and then continue typing in program five. Notice that it will rewrite lines 10,20,30, and 710-740. After 2020, the program uses the familiar PROCgiveQ, FNanswer, and PROCprintans, but they are amended to make use of the data statements tagged on after line 2360. The two major changes are first that filing is replaced with data statement handling in PROCgiveQ. Second, FNanswer again handles four alternatives, read the data in line 2110.

Master data structure

The data can be extended to fit the memory available, but must follow this format:

Line 2360 A data statement with 6 numbers, indicating the start of blocks of data for each of the question colours. As you extend each block of questions, the following start lines for data will increase. This must be reflected in line 2360.

Line 2400 The first data block. The first item of data is the number of questions in this block.

Line 2410 The first question. NB no commas allowed.

Line 2420 Four possible answers plus the correct answer number. Note that each is separated by commas, but no commas at the line ends.
Line 2430 Question two.
Line 2440 Four answers plus correct.
Line 2450 Question three.
Line 2460 Four answers plus correct.
Line 2470 Question four.
Line 2480 Four answers plus correct.
Line 2490 Question five.
Line 2450 Four answers plus correct

The other five blocks will follow this format but with different line numbers.

That's the bones of it! Not as trivial as you might imagine. The only thing left to do is to play the game. Which reminds me. . .who was the first editor of *Acorn User*, and what was Joe's Jottings called before it forgot it's name?

Turn to the yellow pages index on page 113 for details of Joe's trivial game.

PROCESSING PROGRAMS

Take advantage of the advanced features of the Compact and use *View* to write programs

David Atherton

There are three text editors supplied with your Master Compact. *View* and *ABC* are fully fledged word-processors, and there is a screen editing system in the Logotron Logo program.

What is the point of having three editors, you may ask – should you just use one and ignore the others? Does each have any unique features that make it worthwhile learning how to use it?

The answer is that each program has been designed for a particular purpose and has certain strengths and weaknesses. *View* is the best all rounder. It is the most sophisticated of the three, and has the widest range of printing and editing facilities. However, this makes it quite complicated if you want to use all the features.

ABC by contrast is easy to use. This is its principal virtue. It was designed for educational use but is perfectly good for adults. Actually it is quite versatile, but the designer has deliberately hidden this versatility so you don't see it until you have got used to the more basic aspects of the program. The Logo editor, reached by typing EDIT from within Logo, is not designed for wordprocessing. It is only there to help you to type in Logo programs. It is, however, easy and convenient for this purpose. Operating this editor while using Logo will not wipe out other parts of your Logo program.

The Logo editor is not suitable for anything other than writing Logo programs. However, *View* and *ABC* can be used for writing programs in Logo, Basic or indeed any other language, as well as ordinary wordprocessing. *View* stores its programs in a form that is directly readable by Logo and Basic. You can write a Logo program by entering *View* just like any



The Compact has three built-in text editors

other text. While entering the program, it is best if formatting and justification are switched off. This is done by pressing CTRL–f2 and CTRL–f3 while editing. The 'F' and 'J' shown in the top left-hand corner of the screen should disappear.

Before you can run a Logo program written using *View*, you must save it to disc. Suppose the program is called STARS. You would type SAVE STARS from *View*, and then leave *View* by typing *LOGO. From within Logo, you can reload the program by typing LOAD "STARS" as usual. No special conversion is required. The Logo can be viewed prior to running by the Logo EDALL command, or by listing the file straight from disc. You do this by typing *PRINT STARS. If you type *LIST STARS you will get line numbers in front of each line. This can sometimes be useful. A listing can be made to the printer from both of these commands, by pressing CTRL–B before you type the command.

Writing a Logo program in *ABC* is also possible. Logo is very attractive to children and they may be more familiar with the *ABC* wordprocessor. However, the files in *ABC* are not directly compatible, and must be converted to *View* format first. This is done by a program called *Inter*. Page E14 of the Welcome Guide explains this.

Basic programs can also be written using *View* or *ABC*. *ABC* is less suitable because of the way it deals with lines which are more than 40 characters long. *View* however provides a nice method of writing Basic programs. They can be written in the normal way, or alternatively, if you type in the word AUTO on a line of its own at the top of your program text, line numbers can be omitted. Some people prefer to write Basic programs in this way. Once written, a program should be saved and then *BASIC selects the Basic language. The program should be read into Basic by typing *EXEC BPROG followed by pressing Return.

An interesting feature of Compact *View* is that unlike earlier versions on the model B and Master 128, the wordprocessor will accept the full range of 224 characters, not just the standard alphabetic ones. This allows foreign accented characters and simple graphics to be used in text documents.

The range of special characters can be seen in Appendix 2.2 of your Welcome Guide. To type them into your *View* text is a little long-winded but not difficult once you have the hang of it. Each special character is produced by pressing the Shift-CTRL and Code keys all at once, and then releasing them and pressing another key. Listing 4 on the yellow pages shows the keystrokes required for each of these special characters.

There is however a snag when it comes to printing these special characters. Printers

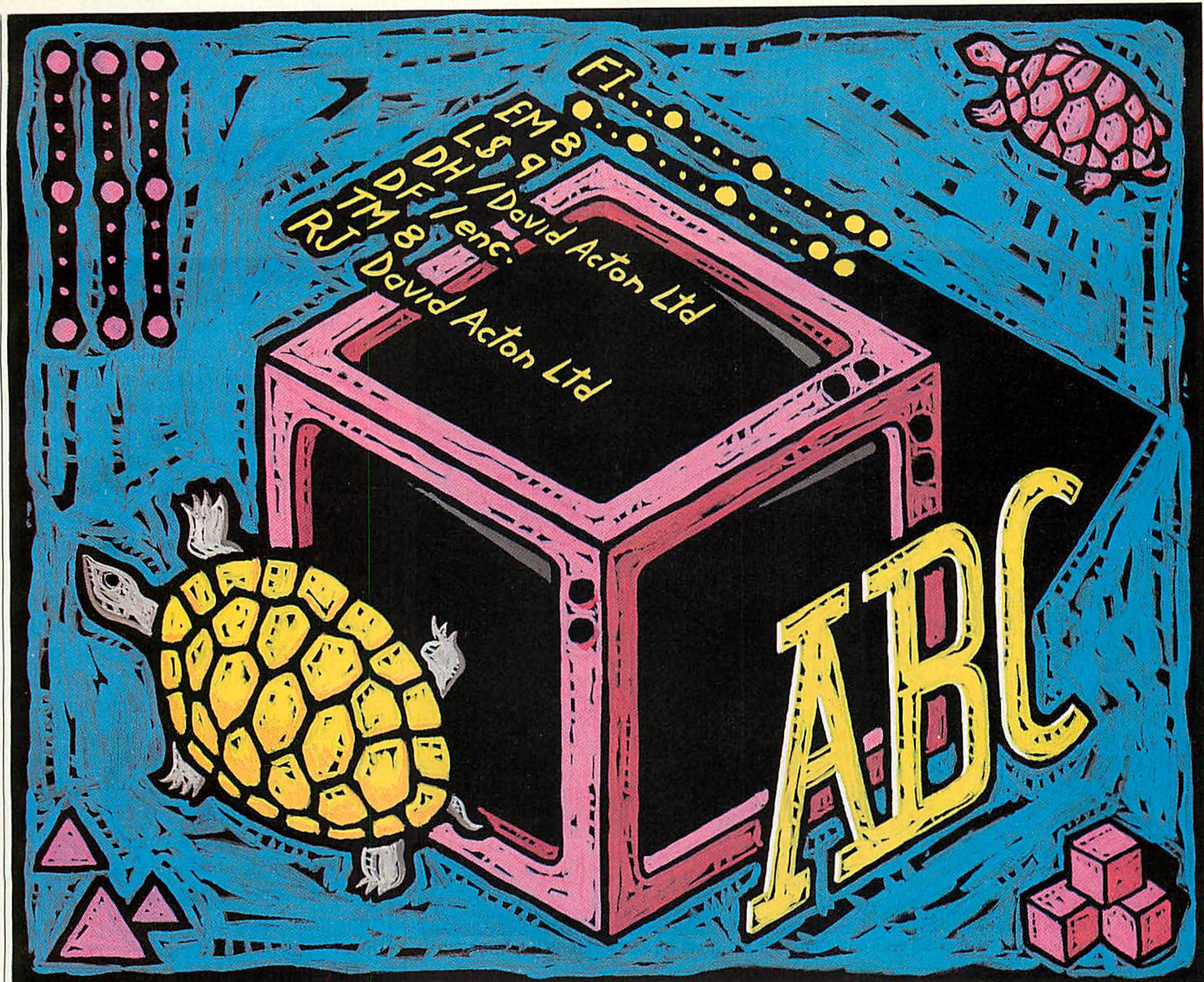


ILLUSTRATION BY STUART BRIERS

normally work on ASCII codes. You type a character and it is sent as a code to the printer. During printing, the printer translates these codes back into character patterns using its own data for the character layout. If you type this line of Basic:

VDU 22, 6, 2: FOR I=160 TO 254:VDU I:NEXT:VDU 3

a row of characters will be printed on both screen and printer but the Compact and printer have each used their own patterns.

Listing 1 on the yellow pages solves the problem for any Epson-compatible dot-matrix printer. When run, it checks all codes going to the printer, and if they are in the standard ASCII range of characters and control codes, they are sent unchanged to the printer. For codes above 127, ie, special characters, the pattern of the character is sent, rather than the code. This causes these characters to be shown correctly on paper as they are on the screen. Note that to use this program, the Epson printer driver supplied with Compact *View* must first be disabled. You do this by typing PRINTER followed by Return from within *View*. Listing 1 makes a file on disc called EPSON1. You should prepare this in advance, then all you need to do is type *EPSON1 before typing PRINT or SHEETS from *View*. The 'EPSON' file must be in your current directory.

It occurred to me when writing this program that if all characters were sent to the printer as patterns, rather than just special ones, then if a new typeface was selected on screen, it would also appear on the printer. Listing 2 on the yellow pages does this.

To use this facility at its best, select one of the unusual typefaces before entering *View*. These are loaded from the Welcome disc. Type *LIB $.LIB* then one of the following: *7BY8, *ITALIC or *THIN. *FX25 is used to restore the standard typeface. When using this program, the line length on a standard matrix printer increases from 80 to 120 columns. This is because the characters are built up with eight dots across, rather than the usual 12 dots of the printer's internal character set. If you are using this program with *View*, you should adjust your ruler accordingly. Listing 2 should be entered in Basic. Running it saves a machine code program to disc called 'EPSON2' which is used in the same way as the previous listing – you simply type *EPSON2 before performing a printing operation.

If you have redefined any of the 224 characters on the Compact using the VDU 23 command explained on pages C58–C59 of the Welcome Guide, these will also be shown in *View* and printed correctly on the printer. This could be particularly useful if you wanted to incorporate say a small graphic design into your print-outs.

A useful feature of the Master Compact is that files containing several commands can be created and then executed together by typing the filename itself as a star command. Listing 3 is a small utility program which will allow files created with *View*, for indeed most other text editors, to be processed as commands just by typing

the filename preceded by a star. Enter *View*, type a set of commonly used commands, for example:

```
*DIR $
*LIB LIBRARY
*7by8
*BASIC
MODE 6
VDU19,0,4;
```

select *View*. The message 'View Bytes free' and so on should appear.
3 Remove 'Welcome', and then insert 'View Disc'
4 Type: *MOUNT then *SRSAVE VIEW 8000+4000 7
5 *BUILD a !BOOT file (we told you how to do this in the December '86 issue) containing this text:

3 Type LOAD "ABC1"
4 Remove the 'Welcome', and then insert 'ABC Disc'
5 Type *MOUNT, then SAVE "ABC1"
5 Repeat steps 2–5 using filenames ABC2, ABC3 and INTER
7 *BUILD a !BOOT file containing a single line CHAIN "ABC1"
8 Type *OPT 4,3

JARGON BOX

ASCII American Standard Code for Information Interchange. This is a set of codes to represent characters, eg, A is 65, B is 66 and so on. It is one of the few things that is truly standard about computer systems. The code only covers 96 standard characters. The Compact has a non-ASCII character in the middle of its range that is the # sign, code 96. The American code didn't include it, and a single quote was lost to accommodate #.
Control codes ASCII codes from 32 to 126 represent normal or 'printable' characters. Codes from zero to 31 cause the printer (or screen) to do such things as horizontal tab, line feed, carriage return and so on. For example typing VDU 65 will show an A on screen, but VDU 12 will clear the screen; it is a control code.
Dot-matrix A type of computer printer which uses individual tiny heads to print dots onto paper. Characters are made up from these dots. Dot-matrix printers can therefore print any typeface or character, unlike daisywheel printers which can only print the fixed typeface.
Editor A computer program for manipulating data, usually text. A full-screen editor, which is the norm, allows you to see a section of text on screen and move with cursor keys to any part of the text. Usually an attempt to move off the edge of the screen results in the display being changed and new text appearing.
Epson-compatible The first major producer of cheap dot-matrix printers was a company called Epson. Most other printer manufacturers set their printers up to use the same codes for facilities such as bold text, graphics, etc, and quickly a standard was set. Now most printers in the market stick to this Epson-compatible set of codes.
Logo A programming language invented by Seymour Papert in the sixties. The language is especially favoured in eduction, and contains within itself a graphics system called 'turtle graphics'.

This is the ABC wordprocessor.

This is the ABC wordprocessor.

The ABC wordprocessor is supplied with the Compact but must be converted using *Inter*

Now save this file from *View*. Call it 'START'. Enter Basic and run Listing 3, giving START as the filename. The file will be altered, and typing *START will now execute these commands. You must be in the directory containing *START when you wish to run it.

This involves transferring a section of the *Welcome* software onto your own disc, thus allowing space for data files of your own. In all cases, the first thing you must do is format a fresh disc. There is a step-by-step guide to this on pages F5 and F6 of your Welcome Guide. The best policy when you buy a box of discs is to format them all so that as you need them, they are already formatted. A box of 10 discs takes 15 minutes. Once you've made up the discs as below, 'booting' them (ie, Shift-Break) will load in *View*, Logo or ABC depending on the type of disc.

Making a *View* disc

1 Format a disc, and label it 'View Disc'.
2 Boot 'Welcome' in the normal way and

```
*SRLOAD VIEW 8000 7 Q I
*WORD
```

6 Type *OPT 4,3

Making a Logo disc

1 Format a disc and label it 'Logo Disc'
2 Boot 'Welcome' and then select the Logo language.
3 Remove the 'Welcome' disc and insert 'Logo Disc'
4 Type *MOUNT then *SRSAVE LOGOROM 8000+4000 7
5 *BUILD a !BOOT file containing:

```
*SRLOAD LOGOROM 8000 7 Q I
*LOGO
```

6 Type *OPT 4,3

If you'd like *View* and Logo in the machine together, with each directly accessible, change the 7 to a 6 in the above command.

Making an *ABC* disc

1 Format a disc and label it 'ABC Disc'
2 Remove 'ABC Disc', insert 'Welcome' and type *DIR $.ABC

Turn to the yellow pages index on page 113 for details of David Atherton's listings.

Micro-Communications - The Next Generation



Commstar II

For more than two years, Commstar has dominated the BBC communications software market. Now, Pace have introduced Commstar II, more powerful, more flexible and even easier to use. Many new facilities like 'pull-down' windows and menus have been added to Commstar's already impressive list of features.

Commstar II is compatible with BBC Model B, B+ and Master Series. Commstar II is still only £29.57 plus V.A.T. and comes complete with a comprehensive instruction manual and a years free subscription to Microlink on Telecom Gold.

Existing users of Commstar can upgrade to the new version for only £12.00, plus V.A.T.



Nightingale V21/V23

The Nightingale modem has become the standard by which other low cost modems are judged.

Combining simplicity of use with true multi baud rate operation, Nightingale can provide access to both viewdata (1200/75 & 75/1200 baud) and full duplex (300/300 baud) systems.

All Pace modems are BABT approved and are supplied with FREE Commstar II software

Linnet V21/V23

Linnet sets new standards in modem performance by combining many facilities, previously available only on 'professional' modems, in a single versatile yet affordable product.

The Linnet provides both 300 baud and 1200/75 operation.

Advanced micro-processor control and Hayes compatibility make it suitable for use on any computer with an RS232 port and it will operate virtually any terminal software.

All features including Automatic dialling are initiated via simple commands entered at the terminal and Linnet's comprehensive tone detection facilities allow full call progress monitoring via English-like messages such as "NO CARRIER" and "NO DIALTONE". Successful calls are notified via the "CONNECT" message common to Hayes modems.

Series Four V21/V23/V22/V22 bis

The last word in microcommunications, Series Four models include as standard V21/23 CCITT capability coupled with 'intelligent' microprocessor control.

Auto dial/auto answer, auto speed buffering, auto baud rate detection, LED carrier strength indicator, 64 number memory and LCD display are amongst features too numerous to mention here, which make Series Four modems the first choice for business and professional applications.

All models are Hayes compatible, they will support multiple baud rates. All Series Four models include as standard V21/V23 and V22 (1200/1200 baud) and V22bis (2400/2400 baud) versions are also available.

Further information on these and other Pace products is available from good dealers everywhere, or direct from Pace.

PACE *BRINGING TOMORROW A LITTLE CLOSER....!*

PACE Micro Technology
Allerton Road, Bradford, West Yorkshire BD15 7AG. Tel. 0274 488211 Telex No. 51338 PACE G
Prestel Mailbox No. 274 729306 Telecom Gold Mailbox No. 79:PCE001 Int. Tel. No. +44274488211

COMPETITION

A NICE DAY AT THE OFFICE

Write a one-line program which will produce a stunning graphics display and win a *Mini Office II* package

Bruce Smith



Ten copies of *Mini Office II* worth nearly £600 are waiting to be won in this month's competition. All you have to do is to write a one-line Basic program which will produce a stunning graphics display.

The program can be in the form of a function key definition, but must be kept to one line and written in BBC Basic. Entries containing machine code or calls other than those documented in the User Guides will be disqualified.

Entries fall into two categories:

- BBC B and BBC B+ micros
- Master 128, BBC B/B+ with Acornsoft Graphics Extension ROM

All entries must be supplied on disc and should include:

- The one-line program
- A *SAVEd version of your display
- Mark the disc with the following:
- Name, address and phone number
- Type of micro and category
- Prize required (see below)

If you wish your disc to be returned then please enclose return packaging and postage. The best five entries from each category will receive a copy of the chart-topping *Mini Office II*. Winners can select from the following versions:

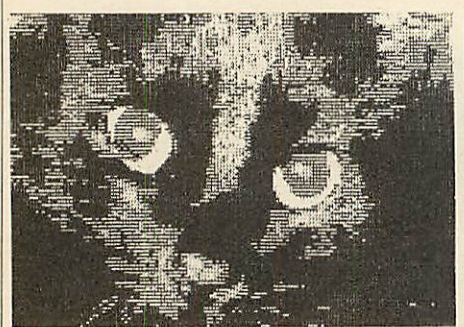
BBC B/B+ tape (worth £14.95), 5.25in disc (worth £16.95), 3in disc (worth £19.95) or the ROM board version (worth £59.95).

Master 128 disc version (worth £29.95).

Send your entry to: March Competition, *Acorn User*, 141 Drury Lane, London, WC2B 5TF, to arrive no later than April 13, 1987. Winners will be notified by post. The Editor's decision is final.

ACORN USER OFFERS

User Dump – Acorn User's printer control ROM – £19.95



Dump graphics screens with User Dump

User Dump includes a ROM chip which plugs into any free sideways ROM socket on your BBC micro, and an easy-to-follow manual. With the *User Dump* ROM installed you'll have access to a wide range of commands to help you control your printer's facilities – all for just £19.95.

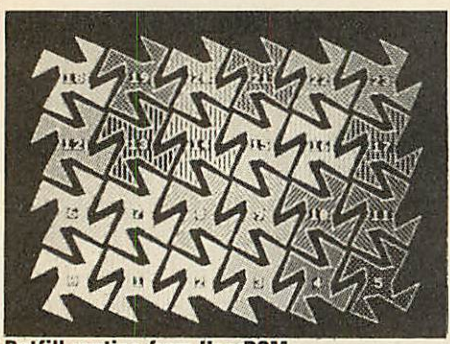
You will be able to dump any screen image in any display mode by entering a single command – either as a line of your program or alternatively by typing in direct from the keyboard. *User Dump* will also give a perfect dump while a machine code program is running.

This versatile ROM will work with all the popular dot-matrix printers, including all those with single and double density bit-image graphics.

Send an A4 SAE to Seran at Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF, for more details.

Order form on page 130.

User ROM – Acorn User on a chip only £19.95



Dotfill routine from UserROM

The *Acorn User UserROM* brings the best of *Acorn User* into your micro. Put together by our technical editor, Bruce Smith, this 8k ROM chip is packed with your favourite *Acorn User* routines. Simply plug the ROM chip into a sideways ROM socket and all the routines are instantly accessible via easy-to-use *commands – what could be simpler?

Routines include the popular colour fill and dot fill routines, bad program recovery, variable lister, function key lister, a graphics compiler, a circle drawing routine, sound compiler, plus lots, lots more!

Included with *UserROM* is a 22-page manual which explains how to get the most from your *UserROM*, and you'll find many demonstration programs showing how to use the new commands.

Full details available by sending an A4 SAE to Seran, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF.

Acorn User Assembler Extension ROM just £19.95!

```
Assembler Extension ROM (AXR) 1.10
 BITS  (Use *BITS for help on OPT)
 ASSM <src> <OPT 1> ((OPT 2)) ((dest))
 DSM ((address)) ((ROM))
 LVAR
 STRIP <fsp> ((:))
 FX 104,0,0 to disable
 Condition: On
```

AXR for machine code programmers

The *Acorn User Assembler Extension ROM (AXR)* is aimed at the machine code programmer. It is compatible with Basic versions 1 and 2 – a Master version is due.

The *AXR* extends the Basic assembler to allow a variety of assembly options and commands. Some are outlined below.

- Bit 0 to 2 – Usual OPT functions
- Bit 3 set – Write to file and RAM
- Bit 4 set – Write to file only
- Bit 5 set – Branch to jump
- Bit 6 set – Enhanced error reporting
- Bit 7 set – Flag duplicate labels

The *AXR* adds several new pseudo op codes to the assembler. These are: ORG – sets the origin for assembly; DST – specify destination; DFB – defines a byte; DFW – define word; DFD – define double word; DFR – define string; SWR – set the sideways RAM number.

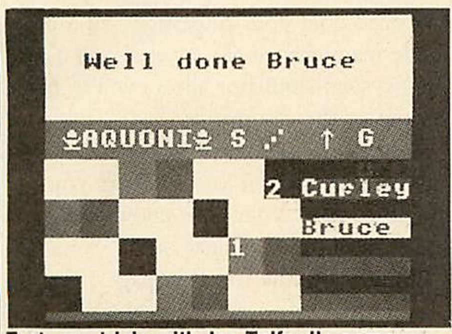
Please send an SAE to Seran at Redwood Publishing for full details.

Order form on page 130 – 24 hour telephone service (0672) 40825

PROGRAM LISTINGS

ACORN USER OFFERS

March listings on cassette £3.95 and disc £5.95



Test your trivia with Joe Telford's game

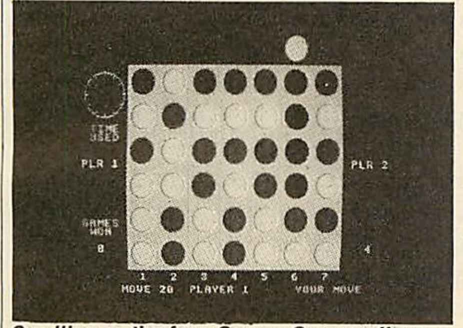
In this special issue, David Johnson-Davies introduces us to artificial intelligence, including three fascinating programs: *Gus*, a program with which you can learn how to guess number sequences, *Lear*, a limerick writing program and *Eliza* a program designed to mimic a conversation – ask it a question and it will answer you!

For entertainment Joe Telford gives us computerised trivia. And this month, David Atherton takes advantage of the advanced features of the Compact by using the *View* wordprocessor to write programs.

All of the programs in this issue are on the cassette and the disc. The cassette is suitable for both the Electron and BBC micros – see page 113 for full details. The discs are available in 5.25in version only.

As a special extra we include a graphics bonus each month on both the cassette and the disc. You'll find your order form on page 129!

Monthly program subscriptions on disc and cassette



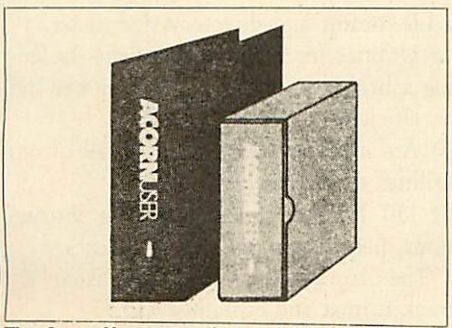
Quadline on the free *Games Compendium*

Save yourself the trouble of ordering your disc or cassette listings each month and take out a subscription. We'll send you our great *Games Compendium* cassette when you apply for a cassette subscription – worth £3.95, or you may prefer to try us out for six months, which will cost you £20, a saving of over £3. These offers are only open to UK subscribers, not overseas.

New *Acorn User* monthly disc subscribers (in the UK) are entitled to receive one of our smart grey cloth disc binders in its own sturdy slip case – normally priced at £9.95. So you'll be able to keep your monthly discs in safety. If you prefer, you may subscribe at the six month discounted price of £30 – a saving of over £5.

Whichever you choose, you won't regret investing in our monthly listings, they'll provide you with useful utilities, graphic abilities, entertainment and much more throughout the year.

Reduced price disc binder at only £6.95



The *Acorn User* magazine and disc binders

For a limited period only, we are offering our superb quality grey cloth *Acorn User* disc binder – in its own slip case for the reduced price of £6.95 – so you'll make a £3 saving when you buy one now.

The binder has a big 30mm capacity so it will hold all of your monthly discs for a year. Also included are six transparent inserts, each capable of holding two 5.25in discs. There is also a sturdy slip case, which will protect the binder and discs.

If you haven't already taken care of it, it's time to get in your orders for your new year's *Acorn User* magazine binder, so that you can go on protecting your precious copies of *Acorn User* magazine from excess wear and tear. The red magazine binder features a wide spine with the capacity to hold 12 issues of more than 200 pages which are held in place with metal strips.

Send in your orders now; see the order form on page 129.

Order form on page 129 & 130 – 24 hour telephone service (0672) 40825

NEW OFFERS

ACORN USER OFFERS

Get out of trouble with the Disc Help Disc – only £6.95

```
A. What are discs & disc drives?
B. Saving & loading BASIC programs
C. Catalogues, Directories & Libraries
D. Copying files & whole discs
E. Deleting files & stopping
   accidental deletion
F. All about auto-booting discs
G. All sorts of odd commands
H. Transferring BASIC programs from
   cassette to disc
I. Test on the DFS
J. About NAMEBUG
```

The *Disc Help Disc's* menu page

Have you just bought a disc interface or disc drive? Do you have a disc interface and drive but are bamboozled by all the jargon? Do you simply want to know all about discs and how to use your disc filing system ROM to its full potential?

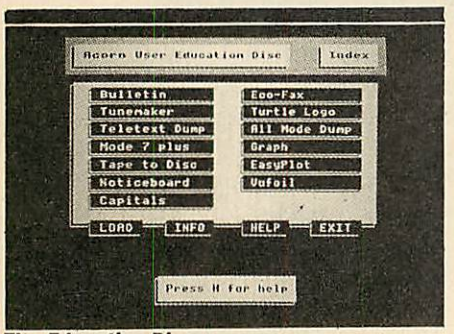
If you answer yes to any of these questions then *Acorn User* has the answer in the form of the *Disc Help Disc*, specially developed for the magazine by the North and Mid-Essex BBC Users Group.

Simply insert the *Disc Help Disc* into your drive and all the information you will ever need is at your fingertips. All aspects of file maintenance are covered and a disc filing system simulator allows you to practise use of the commands.

A question and answer tutorial at the end of each section ensures that you are able to evaluate your own knowledge. The disc is in 80-track format only.

Order using the form on page 130.

Wise up with the Education Disc at just £7.95



The *Education Disc* menu page

The *Education Disc* contains programs drawn from *Acorn User* magazine.

Eco-Fax is a sophisticated viewdata-type database for use on Econet systems, and comes with its own versatile frame editor. There is a colourful version of *Turtle Logo*; a program which shows equations as graphs; and a music writing program which allows you to edit tunes.

Graphics are a strong feature of the collection, including the *Easyplot* drawing software, supported by two other programs which use *Easyplot* screens as an electronic noticeboard or in place of an overhead projector. A bulletin board displays messages in scrolling characters.

There are routines to use in your own Basic programs – screen dumps, a machine code utility and graphics plotting and drawing commands in mode 7. The disc is available in 40 track format only, but can be copied to an 80 track disc.

Network Utility Disc only £19.95



Bring teletext information to networks

The *Acorn User Network Utility Disc* is the logical addition to your network, combining a wide range of invaluable routines with a sophisticated, yet easy-to-use teletext information system. The disc features:

- NetFax – our hybrid information system, provides thousands of pages of information which may be read without affecting any text or program in memory. It features an advanced teletext editor.
- Utilities for all network users, including a file locator and directory size finder.
- Utilities for network managers, including a bridge-compatible screen viewer and an efficient 'notify-all' facility.
- An auto-installer to transfer all of our utilities to your net painlessly.
- 150 NetFax pages, including instructions, help pages and sample indexes.

The *Acorn User Utility* disc is in 80-track format and costs just £19.95.

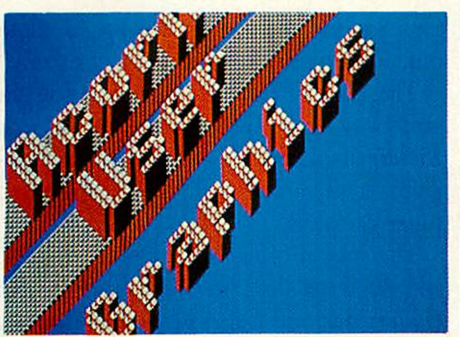
See page 130 for your order form.

Order form on page 130 – 24 hour telephone service (0672) 40825

NEW OFFERS

ACORN USER OFFERS

Graphics Utilities Disc a bargain at £7.95



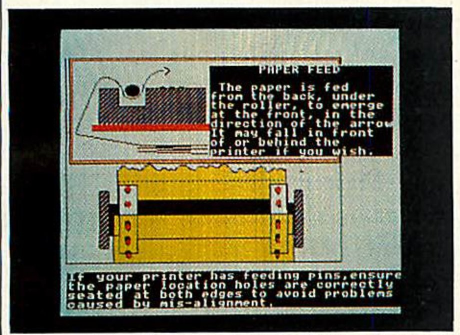
The ***Graphics Utilities Disc*** **makes life easy**

The *Acorn User Graphics Utilities Disc* contains four sections. Sixteen machine code routines enable you to manipulate blocks of graphics. Rotation and reflection utilities are included, together with a screen compressor/expander, a colour flood-fill routine and three screen-mode conversion commands.

The Basic procedure library includes routines to produce multi-height, proportional and justified text as well as a procedure for "drop-shadow" boxes. All of the procedures can be readily used in your own programs.

An advanced teletext screen editor gives you point-plotting and line-drawing, rubber-banding and even a flood-fill. In addition, full text facilities including all the mode 7 control codes are available. The program is easy to use with detailed help screens and has been written in 100 per cent machine-code for speed.

Acorn User's comprehensive Printer Help Disc at £7.95



Printer Help Disc: **much more than a manual**

Written by Benjamin Rietti, the programs and tutorials on this disc will help you to understand your printer's facilities.

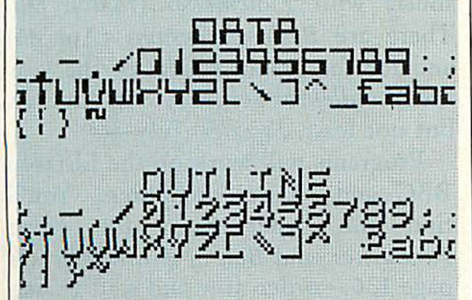
Printer manuals often don't fully cover the needs of Master and BBC micro series owners – our printer help disc will! It includes what to look for in a printer, controlling type styles, using *Wordwise* and *View*, screen images, printer care, an ASCII standard codes table plus how to print £ signs, clear diagrams illustrating various stages of printer use and a program to display type styles. The *Printer Help Disc* will help you solve problems.

The disc is available in 40 and 80 track format, and is compatible with the BBC models B, B+ and Master 128.

For more printer compatibility details please send a stamped addressed envelope to Seran, Redwood Publishing 141-143 Drury Lane, London WC2B 5TF.

Order form on page 130.

Acorn User's Sideways RAM Utilities Disc £9.95



Fonts from the *Sideways RAM Utilities Disc*

What could be more helpful than our new *Sideways RAM Utilities Disc*?

Available in 40 track format with a transfer program for 80 track users, the disc includes:

- RamPad – an electronic notepad you can use at any time. Simply press a key for your computer's answer to the notebook and pencil.
- On-screen fonts – a variety of print styles available in all graphics modes.
- *HLP ROM – add your own help text to call up when you're really stuck.
- Standard ROM header – a sideways ROM header you can use as a starting point when writing your own ROMs.

Many more utilities – including *RLOOK to examine the contents of your ROM's and sideways RAM images. The disc is great value at just £9.95.

Order your *Sideways RAM Utility Disc* using the form on page 130.

Order form on page 130 – 24 hour telephone service (0672) 40825

NEW OFFERS

ACORN USER OFFERS

Gorgeous graphics screens at special prices


Dallas captured on the *Gallery Collection*

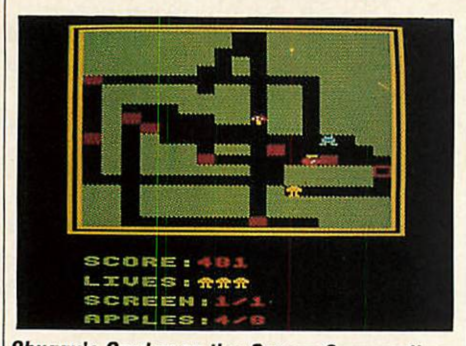
The *Gallery* disc and *Gallery Collection* disc have proved to be so popular with you that we've decided to offer you the chance to buy them both at the special price of £11.95. But hurry, this offer ends on March 12th, 1987!

The *Gallery* disc features an automatic scrolling display of over 20 stunning graphic screens. What's more, the disc gives you the chance to create your own screens with Super Painter and Pixel Editor. Screens include Spiderman, a Coke can, Robotic brilliance and many others.

The *Gallery Collection* presented in the same way as the *Gallery* disc contains over 25 screens, including the Dallas Compendium, a picture of earth from space and super cartoons.

The special offer price applies to the 40 and 80 track discs in 5.25in format. The *Gallery* disc and *Gallery collection* discs are now also available in 3.5in format.

Acorn User's Games Compendium Cassette – £3.95



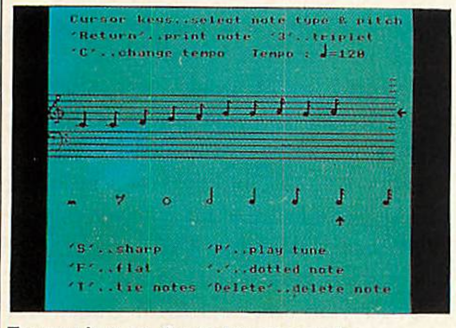
Shuggy's Garden on the *Games Compendium*

The Acorn User Games Compendium brings the best games published in *AU* over the past two years to BBC micro, Master and Electron owners. Included are David Acton's blockbuster *Spectramania* and the popular *Quadline* – see if you can get four in a row! Puzzle fanatics will get great enjoyment from our *Picture Slide* game while many will be amazed at Dave Lawrence's *3-D Maze*. Adventurers can sample the delights of the *Acorn User* office. Why not go collecting apples in *Shuggy's Garden*, or be all at sea in *Run Silent, Run Deep*?

As a special bonus for BBC micro and Master owners, there is Rob Anderson's adventure with scrolling graphics. All programs can be transferred to disc automatically if desired. The cassette costs £3.95.

See page 130 for your order form.

Acorn User Finest Favourites Cassette – just £3.95



Tunemaker: an *Acorn User* favourite

Following the popularity of the *Best of Acorn User* Cassette, we introduce our new favourites selection.

Don't miss captivating curves with *Lisajous Figures* (Nov 85). Use our *Screen Fonts* (Dec 85) to anotate charts and diagrams. And why not save those graphics screens in less space with the *Screen Compression* program (Dec 85).

Cheat at the popular game *Elite* with our *Elite Editor* (Feb 86). Try entering music with *Tunemaker* (March 86). There are *Basic Extensions* (Apr 86) and for the graphics treat of the year the *Mandlebrot Set* (May 86). And last but not least, *Puzzles* (July 86).

Programs will work on the Electron BBC and Master computers. You'll find the order form for *Finest Favourites* and *Best of Acorn User* on page 130 – order now and start having some fun!

Order form on page 130 – 24 hour telephone service (0672) 40825

YELLOW PAGES

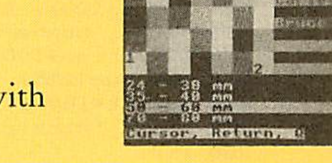
INDEX/COMPATIBILITY

Entering listings

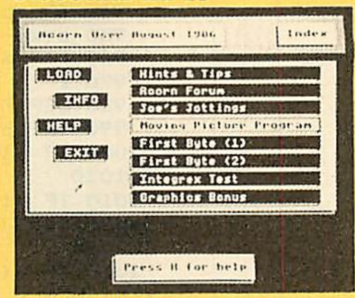
To make the task of entering listings easier, *Acorn User* has adopted several standards in the Yellow Pages. Programs are listed with line numbers in increments of 10, so type AUTO <Return> for automatic line numbering before you start. Before you list what you've entered, type LISTO 1 <Return> to provide spaces after the line numbers. Programs in the Yellow Pages are often listed to a width of 40 characters, so type MODE 6 <Return> before you start. Comparing the line-endings of your listing with the Yellow Pages will help you spot extra or missing characters.

To make sure that the program you want to enter will work on your particular machine, check the index below. All the listings work with Basic 1,2 and 4 (unless stated otherwise) and with operating system OS1.2 or above. If a program is accompanied by an article, please read the article first. If special care is needed when entering, we provide a 'How to Enter' box.

Once you've typed in your program, save it to tape or disc then test it by running it. If you have a major problem with a listing, ask someone to check it. You can also send off for a list of *Checksums* which help you find the errors. Send a large SAE (24p stamp) to *AU* Checksums, PO Box 641, London NW9 8TF.



DISCS AND TAPES



All the listings on these pages can be found on this month's listings disc or cassette. See page 109 for details.

BACK ISSUES





For help with entering and debugging listings see the following back issues: April '86, June '85, Aug '84, Sept '83.

Program	Page	BBCB	BBCB+/ 128k	BBC with ADFS	Shadow RAM	Electron	Electron with Plus 1	Electron with Plus 1 & Plus 3	Master 128	Master 128 + ADFS	Master Compact	6502SP	Econet	Monthly tape & disc
Artificial Intelligence														
Gus	114	✓	✓	×	✓	✓	✓	×	✓	✓	✓	✓	✓	✓
Lear	117	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eliza 1	117	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eliza 2	118	✓	✓	×	✓	✓	✓	×	✓	✓	✓	✓	✓	✓
Joes Jotting's														
Listing 1	120	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓
Listing 2	121	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Listings 3	122	✓	✓	×	✓	✓	✓	×	✓	✓	✓	×	✓	✓
Listing 4	125	×	✓	×	✓	×	×	×	✓	✓	✓	×	✓	✓
Listings 5-10	126	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
David Atherton														
Listing 1*	127	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Listing 2*	128	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Listing 3	128	✓	✓	✓	✓	×	×	✓	✓	✓	✓	✓	✓	✓
Listing 4	128	×	×	×	×	×	×	×	×	×	×	×	✓	×

* Requires Epson-compatible printer

See What Comes Next? page 85

Listing 1. Sequence guessing program (*Gus*)

```
   10 REM GUS: Sequence Guessing Program
   20 REM By David Deutsch and David Johnson-Davies
   30 REM For BBC B/B+/M/C/E
   40 REM (c) Acorn User  March 1987
   50 :
   60 MODE 7
   70 PROCinit
   80 sp=0
   90 REPEAT
  100 PROCmain
  110 PRINT
  120 UNTIL NOT (FNask("Another sequence"))
  130 IF nstand=natom THEN END
  140 file=OPENOUT "DATA"
  150 FOR i=natom+1 TO nstand
  160 PRINT#file,s$(i)
  170 NEXT
  180 PRINT# file,""
  190 CLOSE# file
  200 END
  210 :
  220 DEF PROCinit
  230 DIM s(100), t(100), s$(100), z(100), es$(100), number$(20)
  240 DIM prime(100), fact(20)
  250 DIM num(255)
  260 maxint=1E9-1 : maxln=LN(maxint)
  270 PRINT "Atomic Commands:"'
  280 :
  290 nprimes=0
  300 REPEAT
  310 nprimes=nprimes+1
  320 READ prime(nprimes)
  330 UNTIL prime(nprimes)=0
  340 nprimes=nprimes-1 : prime(0)=1
  350 :
  360 nfacts=0
  370 REPEAT
  380 nfacts=nfacts+1
  390 READ fact(nfacts)
  400 UNTIL fact(nfacts)=0
  410 nfacts=nfacts-1 : fact(0)=1
  420 :
  430 nstand=0
  440 REPEAT
  450 nstand=nstand+1
  460 READ s$(nstand),a$
  470 PRINT s$(nstand);" ";
  480 IF a$<>"" PRINT a$
  490 UNTIL s$(nstand)=""
  500 nstand=nstand-1 : natom=nstand
  510 FOR i=1 TO nstand : num(ASC(s$(i)))=i : NEXT
  520 :
  530 DIM pair(nstand,nstand)
  540 FOR i=1 TO nstand : FOR j=1 TO nstand : pair(i,j)=TRUE : NEXT j,i
  550 REPEAT
  560 READ a$
  570 IF a$<>"" THEN pair(num(ASC(LEFT$(a$,1))),num(ASC(RIGHT$(a$,1))))=FALSE
  580 UNTIL a$=""
  590 :
  600 file=OPENUP ("DATA")
  610 IF file<>0 THEN PRINT ''"Previous Experience:" :REPEAT nstand=nstand+1 : INPUT# file,s$(nstand) : PRINTs$(nstand) : UNTIL s$(nstand)="" : nstand=nstand-1 : CLOSE# file
  620 :
  630 n=-1
  640 REPEAT
```

Continued ▶

◀ *Gus* continued

```
  650 n=n+1
  660 READ number$(n)
  670 UNTIL number$(n)=""
  680 ENDPROC
  690 :
  700 DEF FNrun(t$)
  710 REM returns:  -1 => underflow, 0 => successful evaluation, 1 => error
  720 LOCAL n,ret,a$
  730 IF LEN(t$)=0 THEN =0
  740 number=sp+2
  750 n=0 : ret=0
  760 REPEAT
  770 n=n+1
  780 a$=MID$(t$,n,1)
  790 IF a$>="0" AND a$<="@" sp=sp+1 : s(sp)=ASC(a$)-ASC("0") ELSE ret=EVAL("FN"+a$)
  800 UNTIL n>=LEN(t$) OR ret<>0
  810 = ret
  820 :
  830 DEF FNp
  840 IF sp=0 THEN = -1
  850 s(sp-1)=s(sp-1)+s(sp) : sp=sp-1
  860 = -(ABS(s(sp))>maxint)
  870 :
  880 DEF FNm
  890 IF sp=0 = -1
  900 s(sp-1)=s(sp-1)-s(sp) : sp=sp-1
  910 = -(ABS(s(sp))>maxint)
  920 :
  930 DEF FNt
  940 IF sp=0 THEN = -1
  950 s(sp-1)=s(sp-1)*s(sp) : sp=sp-1
  960 = -(ABS(s(sp))>maxint)
  970 :
  980 DEF FNe
  990 IF sp=0 THEN = -1
 1000 IF s(sp-1)=0 s(sp)=-(s(sp)>0) : GOTO1030
 1010 IF s(sp)>0 THEN 1020 ELSE IF ABS(s(sp-1))<>1 =1 ELSE s(sp)=s(sp)MOD 2 : GOTO1030
 1020 IF s(sp)*LN(ABS(s(sp-1))+1E-10)>maxln THEN = 1
 1030 s(sp-1)=s(sp-1)^s(sp) : sp=sp-1
 1040 = 0
 1050 :
 1060 DEF FNr
 1070 IF sp=0 THEN = -1
 1080 IF s(sp)=0 THEN = 1
 1090 s(sp-1)=s(sp-1)MOD s(sp) : sp=sp-1
 1100 = 0
 1110 :
 1120 DEF FNd
 1130 IF sp=0 THEN = -1
 1140 IF s(sp)=0 THEN = 1
 1150 s(sp-1)=s(sp-1)DIV s(sp) : sp=sp-1
 1160 = 0
 1170 :
 1180 DEF FNn
 1190 sp=sp+1 : s(sp)=number
 1200 = 0
 1210 :
 1220 DEF FNP
 1230 IF s(sp)>nprimes OR s(sp)<0 THEN = 1 ELSE s(sp)=prime(s(sp)) : = 0
 1240 :
 1250 DEF FNF
 1260 IF s(sp)>nfacts OR s(sp)<0 THEN = 1 ELSE s(sp)=fact(s(sp)) : = 0
 1270 :
 1280 DEF FNc
```

Continued ▶

◀ **Gus** continued

```
1290 sp=sp+1 : s(sp)=s(sp-1)
1300 = 0
1310 :
1320 DEF FNw
1330 LOCAL t
1340 IF sp=0 THEN = -1 ELSE t=s(sp-1) :
s(sp-1)=s(sp) : s(sp)=t
1350 = 0
1360 :
1370 DEF FNo
1380 IF sp=0 THEN = -1 ELSE sp=sp-1: =0
1390 :
1400 DEF PROCinput
1410 LOCAL i
1420 PRINT ''
1430 REPEAT
1440 INPUT "How many terms (at least 4)
? "nterms
1450 UNTIL nterms>=4
1460 FOR i=1 TO nterms
1470 PRINT "term(";i;") = "; : INPUT t(
i-1)
1480 NEXT
1490 INPUT "Time limit (in seconds) = "
maxt : maxtime=maxt
1500 ENDPROC
1510 :
1520 DEF PROCmain
1530 LOCAL i,j,nsubs,t
1540 PROCinput : PRINT ''
1550 TIME=0
1560 nsubs=0 : stop=FALSE : found=FALSE
1570 REPEAT
1580 nsubs=nsubs+1
1590 FOR i=1 TO nsubs : z(i)=1 : NEXT
1600 REPEAT
1610 g$=FNcombine(nsubs)
1620 IF FNconsistent(g$) THEN t=TIME :
stop=FNguess(g$) : TIME=t
1630 IF TIME>=maxtime*100 THEN stop=TRU
E : PRINT : t=TIME : IF FNask("Continue
for another "+STR$(maxt)+" seconds") sto
p=FALSE : maxtime=maxtime+maxt : TIME=t
1640 UNTIL NOT FNnext(nsubs) OR stop
1650 UNTIL stop
1660 IF found THEN ENDPROC
1670 PRINT
1680 IF NOT FNask("Give me the answer")
: ENDPROC
1690 INPUT "GUSL string = "a$
1700 IF NOT FNconsistent(a$) PRINT : PR
OCprint("That does not satisfy the terms
 you gave me.") : GOTO 1670
1710 nstand=nstand+1 : s$(nstand)=a$
1720 PRINT '"Adding "a$
1730 ENDPROC
1740 :
1750 DEF PROCcopy(n)
1760 LOCAL i
1770 FOR i=1 TO n
1780 s(i-1)=t(i-1)
1790 NEXT
1800 sp=n-1
1810 ENDPROC
1820 :
1830 DEF PROCstatus
1840 LOCAL i
1850 PRINT "sp=";sp
1860 FOR i=0 TO sp
1870 PRINT s(i);", ";
1880 NEXT
1890 ENDPROC
1900 :
```

Continued ▶

◀ **Gus** continued

```
1910 DEF FNconsistent(a$)
1920 LOCAL n,r
1930 n=nterms
1940 REPEAT
1950 n=n-1
1960 PROCcopy(n)
1970 r=FNrun(a$)
1980 UNTIL r<>0 OR n<=1 OR s(sp)<>t(n)
1990 IF r>0 THEN =FALSE ELSE IF r=0 THE
N =(s(sp)=t(n)) ELSE =(n<nterms-2)
2000 :
2010 DEF FNcombine(n)
2020 LOCAL i
2030 g$=""
2040 FOR i=1 TO n
2050 g$=g$+s$(z(i))
2060 NEXT
2070 = g$
2080 :
2090 DEF FNnext(n)
2100 LOCAL i,j,carry
2110 carry=TRUE : i=0
2120 REPEAT
2130 i=i+1
2140 z(i)=z(i)+1 : IF z(i)>nstand THEN
z(i)=1 : carry=TRUE ELSE carry=FALSE
2150 IF i=n THEN IF NOT carry THEN IF I
NSTR("pterdmPF",RIGHT$(s$(z(n)),1))=0 GO
TO 2140
2160 UNTIL i=n OR NOT carry
2170 IF carry THEN =FALSE ELSE IF n=1 T
HEN =TRUE
2180 j=1
2190 REPEAT
2200 IF NOT pair(num(ASC(RIGHT$(s$(z(j)
),1))),num(ASC(LEFT$(s$(z(j+1)),1)))) TH
EN j=n+2
2210 j=j+1
2220 UNTIL j>i OR j>=n
2230 IF j=n+3 THEN 2110
2240 = TRUE
2250 :
2260 DEF FNguess(a$)
2270 PRINT ''"(";a$;") ";TIME DIV 100;"
 secs."'
2280 PROCsay(a$)
2290 PROCcopy(nterms)
2300 IF FNrun(a$)=0 THEN PROCprint(" Th
at would make the "+STR$(nterms+1)+"th t
erm "+STR$(s(sp))+".")
2310 PRINT ' : IF FNask("Is that correc
t") PROCremember : found=TRUE : =TRUE
2320 = NOT FNask("Continue trying")
2330 :
2340 DEF FNask(a$)
2350 PRINT a$;
2360 REPEAT
2370 INPUTA$
2380 UNTIL A$="Y" OR A$="y" OR A$="N" O
R A$="n"
2390 IF A$="N" OR A$="n" THEN = FALSE
2400 = TRUE
2410 :
2420 DEF PROCremember
2430 IF nsubs=1 THEN ENDPROC
2440 FOR i=2 TO nsubs
2450 nstand=nstand+1 : s$(nstand)=s$(z(
i-1))+s$(z(i))
2460 PRINT '"Adding "s$(nstand)
2470 NEXT
2480 ENDPROC
2490 :
2500 DEF PROCprint(a$)
```

Continued ▶

◄ *Gus* continued

```
2510 IF a$="" THEN ENDPROC
2520 IF POS=0 AND LEFT$(a$,1)=" " THEN PROCprint(RIGHT$(a$,LEN(a$)-1)) : ENDPROC
2530 IF LEN(a$)<40-POS THEN PRINTa$; : ENDPROC
2540 IF a$=" " THEN PRINT : ENDPROC
2550 IF INSTR(a$,"-")<>0 AND INSTR(a$,"-")<>LEN(a$) THEN PROCprint(LEFT$(a$,INSTR(a$,"-"))) : PROCprint(RIGHT$(a$,LEN(a$)-INSTR(a$,"-"))) : ENDPROC
2560 IF INSTR(a$," ")=0 OR INSTR(a$," ")=LEN(a$) THEN PRINT 'a$; : ENDPROC
2570 PROCprint(LEFT$(a$,INSTR(a$," ")))
2580 PROCprint(RIGHT$(a$,LEN(a$)-INSTR(a$," ")))
2590 ENDPROC
2600 :
2610 DEF PROCsay(a$)
2620 PROCprint("I think that each new term is ")
2630 gus$=""
2640 FOR n=128 TO 144
2650 gus$=CHR$(n)+gus$
2660 NEXT
2670 gus$=gus$+a$ : PROCerun(FALSE) : PRINT "."'
2680 ENDPROC
2690 :
2700 DEF PROCifprint(a$,silent)
2710 IF NOT silent THEN PROCprint(a$)
2720 ENDPROC
2730 :
2740 DEF PROCerun(silent)
2750 LOCAL u$,c
2760 u$=RIGHT$(gus$,1)
2770 gus$=LEFT$(gus$,LEN(gus$)-1)
2780 IF u$>="0" AND u$<="@" THEN PROCifprint(number$(ASC(u$)-ASC("0")),silent) : ENDPROC
2790 IF ASC(u$)>=128 PROCsayterm(ASC(u$)-128,silent) : ENDPROC
2800 IF u$=")" PROCerun(silent) : c=1 : PROCbrackets
2810 dummy=EVAL("FNe"+u$+"(silent)")
2820 ENDPROC
2830 :
2840 DEF PROCbrackets
2850 REPEAT
2860 u$=RIGHT$(gus$,1)
2870 c=c+(u$="(")-(u$=")")
2880 gus$=LEFT$(gus$,LEN(gus$)-1)
2890 UNTIL c=0
2900 ENDPROC
2910 :
2920 DEF PROCsayterm(t,silent)
2930 IF silent ENDPROC
2940 PROCprint("the ")
2950 IF t=0 THEN PROCprint("last ") ELSE PROCprint(STRING$(t-1,"ante-")+"penultimate ")
2960 PROCprint("term ")
2970 ENDPROC
2980 :
2990 DEF FNep(silent)
3000 PROCifprint("the sum of ",silent)
3010 PROCerun(silent)
3020 PROCifprint("and ",silent)
3030 PROCerun(silent)
3040 = 0
3050 :
3060 DEF FNem(silent) : LOCAL egus$
```

Continued ►

◄ *Gus* continued

```
3070 PROCifprint("the difference between ",silent)
3080 egus$=gus$
3090 PROCerun(TRUE) : PROCerun(silent)
3100 gus$=egus$ : PROCifprint("and ",silent)
3110 PROCerun(silent) : PROCerun(TRUE)
3120 = 0
3130 :
3140 DEF FNet(silent)
3150 PROCifprint("the product of ",silent)
3160 PROCerun(silent)
3170 PROCifprint("with ",silent)
3180 PROCerun(silent)
3190 = 0
3200 :
3210 DEF FNee(silent)
3220 LOCAL egus$
3230 PROCifprint("the result of rairing ",silent)
3240 egus$=gus$
3250 PROCerun(TRUE) : PROCerun(silent)
3260 gus$=egus$ : PROCifprint("to the power of ",silent)
3270 PROCerun(silent) : PROCerun(TRUE)
3280 = 0
3290 :
3300 DEF FNer(silent)
3310 LOCAL egus$
3320 PROCifprint("the remainder when ",silent)
3330 egus$=gus$
3340 PROCerun(TRUE) : PROCerun(silent)
3350 gus$=egus$ : PROCifprint("is divided by ",silent)
3360 PROCerun(silent) : PROCerun(TRUE)
3370 = 0
3380 :
3390 DEF FNed(silent)
3400 LOCAL egus$
3410 PROCifprint("the integer part of the quotient when ",silent)
3420 egus$=gus$
3430 PROCerun(TRUE) : PROCerun(silent)
3440 gus$=egus$ : PROCifprint("is divided by ",silent)
3450 PROCerun(silent) : PROCerun(TRUE)
3460 = 0
3470 :
3480 DEF FNen(silent)
3490 PROCifprint("the number of the new term ",silent)
3500 = 0
3510 :
3520 DEF FNeP(silent)
3530 PROCifprint("the prime whose position in the sequence of primes is ",silent)
3540 PROCerun(silent)
3550 = 0
3560 :
3570 DEF FNeF(silent)
3580 PROCifprint("the factorial of ",silent)
3590 PROCerun(silent)
3600 = 0
3610 :
3620 DEF FNec(silent)
3630 LOCAL egus$
3640 egus$=gus$
3650 PROCerun(silent)
```

Continued ►

◀ *Gus* continued

```
3660 gus$=egus$
3670 = 0
3680 :
3690 DEF FNew(silent)
3700 LOCAL egus$
3710 egus$=gus$
3720 PROCerun(TRUE)
3730 PROCerun(silent)
3740 gus$=gus$+"("+RIGHT$(egus$,LEN(egu
s$)-LEN(gus$))+")"
3750 = 0
3760 :
3770 DEF FNeo(silent)
3780 PROCerun(TRUE)
3790 PROCerun(silent)
3800 = 0
3810 :
3820 DATA 2,3,5,7,11,13,17,19,23,29,31
3830 DATA 37,41,43,47,53,59,61,67,71,73
3840 DATA 79,83,89,97,101,0
3850 DATA 1,2,6,24,120,720,5040,40320
3860 DATA 362880,3628800,39916800
3870 DATA 479001600,0
3880 DATA p,plus,t,times,e,exponentiate
3890 DATA r,remainder,d,divide,m,minus
3900 DATA c,copy,o,pop,w,swap,n,number
3910 DATA P,prime,F,factorial,1,1,2,2
3920 DATA 3,3,4,4,5,5,":",10,"",""
3930 DATA po,to,eo,ro,do,mo,cp,ct,cr,cd
3940 DATA cm,cp,cw,wp,wt,ww,no,nn,Po,PP
3950 DATA PF,Fe,Fr,Fo,FP,FF,1t,1e,1d
3960 DATA 1c,1o,1P,1F,11,12,13,14,15,2c
3970 DATA 2o,2P,2F,3c,3o,3P,3F,4c,4o,5c
3980 DATA 5o,":c",":o",":e",""
3990 DATA "zero ","one ","two ","three
"
4000 DATA "four ","five ","six ","seven
"
4010 DATA "eight ","nine ","ten ","elev
en "
4020 DATA ""
```

◀ *Lear* continued

```
280 PRINT "of ";
290 R=Z : PROCword
300 PRINT "."
310 END
320 :
330 DEF PROCrnd
340 R=ABS RND MOD 5
350 PROCword
360 ENDPROC
370 :
380 DEF PROCword
390 RESTORE P
400 FOR N=0 TO R
410 READ C$
420 NEXT
430 C$=C$+" "
440 PRINT C$; : P=P+10
450 ENDPROC
460 :
470 DATA sordid,graceful,wily,vicious,
really,sparkling
480 DATA green,young,vile,bland,old,wi
ld
490 DATA duchess,grocer,glutton,flauti
st,laundress,sailor
500 DATA Wembley,Spain,Chad,Speke,Slou
gh,France
510 DATA wanted,followed,counted,demol
ished,collected,swallowed
520 DATA some stamps,a stoat,a nude,so
me cakes,a frog,some mould
530 DATA and felt trembly,on a train,a
nd went mad,twice a week,with a cow,in a
 trance
540 DATA she,he,she,he,she,he
550 DATA quick,slow,few,hard,late,long
560 DATA noticed,followed,asked for,lo
oked for,wanted,longed for
570 DATA a brick,some dough,a pew,some
lard,a plate,a song
```

See I say, I say, I say, page 89

Listing 1. The limerick writer (*Lear*)

```
10 REM LEAR
20 REM By David Johnson-Davies
30 REM For BBC B/B+/M/C/E
40 REM (c) Acorn User  March 1987
50 :
60 L=470
70 P=L : PRINT "A ";
80 PROCrnd
90 W=R : PROCrnd
100 X=R : PROCrnd : Y=R
110 PRINT "from ";
120 PROCrnd : Z=R : PRINT
130 PRINT "Once "; : PROCrnd
140 G$=C$
150 PROCrnd : R=Z
160 PROCword : PRINT
170 R=Y : PROCword
180 H$=C$ : PRINT G$;"so ";
190 PROCrnd : T=R
200 PRINT '"That ";H$;
210 PROCrnd : R=T
220 PROCword : PRINT
230 PRINT "This ";
240 P=L : R=W
250 PROCword : R=X
260 PROCword : R=Y
270 PROCword
```

Continued ▶

See Explain that to me, page 90

Listing 1. Function definitions for *Eliza*

```
31000 REM List-Processing Package
31010 REM By Rod Nicolson
31020 REM For BBC B/B+/M/C/E
31030 REM (c) Acorn User  March 1987
31040 :
31050 DEF FN_list(list$)
31060 IF LEFT$(list$,1) = RIGHT$(list$,1
) THEN = 1 ELSE = 0
31070 :
31080 DEF FN_unlist(list$)
31090 LOCAL n%,sep$
31100 IF LENlist$ <= 2 THEN = 0
31110 IF FN_list(list$)=0 THEN = -1
31120 n%=0 : sep$=LEFT$(list$,1)
31130 REPEAT
31140 n%=n%+1
31150 L$(n%)=FN_head(list$)
31160 list$=RIGHT$(list$,LEN(list$)-LEN(
L$(n%))-1)
31170 UNTIL LENlist$<=2
31180 = n%
31190 :
31200 DEF FN_enlist(max%,sep$)
31210 LOCAL n%,list$
31220 list$=sep$
31230 FORn%=1 TO max%
31240 list$=list$+L$(n%)+sep$
```

Continued ▶

◀ *Eliza* listing 1 continued

```
31250 NEXT
31260 = list$
31270 :
31280 DEF FN_head(list$)
31290 LOCAL n%
31300 n%=INSTR(RIGHT$(list$,LENlist$-1),
LEFT$(list$,1))
31310 =MID$(list$,2,n%-1)
31320 :
31330 DEF FN_tail(list$)
31340 LOCAL n%,sep$
31350 sep$=LEFT$(list$,1)
31360 n%=INSTR(RIGHT$(list$,LENlist$-1),
sep$)
31370 IF n%<LEN(list$)-1 THEN = sep$+MID
$(list$,n%+2,LENlist$) ELSE = sep$+sep$
31380 :
31390 DEF FN_member(item$,list$)
31400 LOCAL n%,sep$,s$
31410 sep$=LEFT$(list$,1)
31420 s$=sep$+item$+sep$
31430 IF LENs$>LENlist$ THEN = 0
31440 n%=INSTR(list$,s$) : IF n%=0 THEN
= 0
31450 = 1+FN_unlist(LEFT$(list$,n%))
31460 :
31470 DEF FN_add_element(element$,list$)
31480 IF LENlist$=2 THEN list$=LEFT$(lis
t$,1) ELSE IF list$="" THEN list$=sep$
31490 = LEFT$(list$,1)+item$+list$
31500 :
31510 DEF FN_add_list(list1$,list2$)
31520 LOCAL sep2$,l1$,m1%
31530 sep2$=LEFT$(list2$,1)
31540 m1%=FN_unlist(list1$)
31550 IF m1%=0 THEN = list2$
31560 l1$=FN_enlist(m1%,sep2$)
31570 IF LEN(list2$)<=2 THEN = l1$ ELSE
= LEFT$(l1$,LEN(l1$)-1)+list2$
31580 :
31590 DEF FN_intersection(list1$, list2$
)
31600 LOCAL out$,n%,m%,j%,sep$,l$
31610 out$="" : sep$=LEFT$(list2$,1)
31620 m%=FN_unlist(list1$)
31630 FOR n%=1 TO m%
31640 IF n%>1 THEN m%=FN_unlist(list1$)
31650 l$=L$(n%) : j%=FN_member(l$,list2$
)
31660 IF j%>0 THEN out$=out$+sep$+l$
31670 NEXT
31680 IFout$="" THEN = sep$+sep$
31690 = out$+sep$
```

Listing 2. Main *Eliza* program

```
   10 REM ELIZA
   20 REM By Rod Nicolson
   30 REM For BBC B/B+/M/C/E
   40 REM (c) Acorn User  March 1987
   50 :
   60 MODE7
   70 PROC_setup_prog
   80 PROC_intro
   90 REPEAT
  100 PROC_clear
  110 in$=FN_input_line
  120 IF RIGHT$(in$,1)="?" THEN Question
%=1 ELSE Question%=0
  130 in1$=FN_tidy(in$)
  140 in2$=FN_exchange(in1$)
```

Continued

◀ *Eliza* continued

```
  150 match$=FN_match(in2$)
  160 IF Skip_rest%=0 THEN out$=FN_trans
form(match$,in2$) ELSE out$=match$
  170 Last$=out$
  180 IF FN_list(out$) THEN out$=FN_head
(out$)
  190 PROC_print(0,-1,out$)
  200 UNTIL End%
  210 END
  220 :
  230 DFF PROC_setup_prog
  240 DIM L$(15)
  250 Family$=",family,parent,parents,wi
fe,husband,son,sons,mother,father,sister
,sisters,brother,brothers,daughter,daugh
ters,"
  260 Rude$=",idiot,stupid,wally,twit,du
mb,plonker,"
  270 Question$=",why,what,when,who,how,
"
  280 Neg$=",not,no,wont,cant,dont,never
,nobody,noone,"
  290 Friends$=",boyfriend,girlfriend,fr
iend,friends,lover,mate,mates,"
  300 Good_feelings$=",like,likes,happy,
love,loves,"
  310 Bad_feelings$=",dislike,dislikes,u
nhappy,hate,hates,depressed,suicidal,"
  320 Important$=",need,job,work,unemplo
yed,home,customers,"
  330 Greetings$=",hello,hi,goodbye,bye,
cheerio,finish,"
  340 Exchange$="/,i am,you. are,/,i was
,you. were,/,you are,I am,/,you were,I w
as,/,are you,am I,/,am i,are you.,/,were
 you,was I,/,was i,were you.,/,i,you.,/,
me,you.,/,you,me,/,my,your.,/,us,you,/,y
our,my,/"
  350 Yes_no$=",yes,no,may,might,perhaps
,"
  360 Mentioned$=" parents " : Last$="//
"
  370 End%=0 : Greet%=0
  380 Trace%=0 : REM change this to Trac
e%=1 to turn on trace messages
  390 ENDPROC
  400 :
  410 DEF PROC_intro
  420 CLS
  430 PRINT "ELIZA"''"Please tell me abo
ut your problems"
  440 PROC_print(0,4,"I can't guarantee
success, but often it helps just to talk
 problems over.")
  450 PRINT
  460 ENDPROC
  470 :
  480 DEF PROC_clear
  490 Exchanges%=0 : Rude%=0 : Skip_rest
%=0 : Neg%=0
  500 ENDPROC
  510 :
  520 DEF FN_input_line
  530 LOCAL in$,a$
  540 REPEAT
  550 PRINT ">>";
  560 in$=GET$
  570 PRINT in$;
  580 UNTIL in$<>CHR$13
  590 REPEAT
  600 a$=INKEY$(3000) : PRINTa$;
  610 IF a$<>CHR$13 in$=in$+a$
```

Continued ▶

◄ *Eliza* continued

```
620 IF a$=CHR$127 in$=LEFT$(in$,LEN(in
$)-2)
630 UNTIL a$=CHR$13 OR a$="" OR a$="."
OR a$="!" OR a$="?"
640 PRINT
650 = in$
660 :
670 DEF FN_tidy(in$)
680 LOCAL a$,a%,n%,out$
690 out$=" "
700 FOR n%=1 TO LEN(in$)
710 a$=MID$(in$,n%,1):a%=ASC(a$)
720 IF a%>64 AND a%<91 THEN out$=out$+
CHR$(a%+32)
730 IF (a%>96 AND a%<127) OR (a%>47 AN
D a%<58) THEN out$=out$+a$
740 IF a%=32 AND RIGHT$(out$,1)<>" " T
HEN out$=out$+" "
750 NEXT
760 = out$+" "
770 :
780 DEF FN_exchange(in$)
790 LOCAL n%,m%,m1%,m2%,j%,out$,sep$,l
1$,l2$
800 sep$=LEFT$(in$,1) : out$=in$
810 m%=FN_unlist(Exchange$)
820 FORn%=1 TO m%
830 IF n%>1 THEN m%=FN_unlist(Exchange
$)
840 m1%=FN_unlist(L$(n%))
850 l1$=L$(1) : l2$=L$(2)
860 IF LEN(l1$)+2<LEN(out$) THEN j%=IN
STR(out$,sep$+l1$+sep$) ELSE j%=0
870 IF j%>0 THEN out$=LEFT$(out$,j%)+l
2$+RIGHT$(out$,LEN(out$)-LEN(l1$)-j%) :
Exchnges%=Exchanges%+1
880 NEXT
890 m%=FN_unlist("."+out$+"."):out$=FN
_enlist(m%,"")
900 = out$
910 :
920 DEF FN_match(in$)
930 LOCAL words%,greet$,key_words$,s$
940 words%=FN_unlist(in$)
950 IF words%=0 THEN Skip_rest%=1 : =
"I'm not telepathic  - please type in so
me WORDS!"
960 greet$=FN_intersection(Greetings$,
in$)
970 IF LEN(greet$)>2 THEN = FN_greet(F
N_head(greet$))
980 IF LEN(FN_intersection(Rude$,in$))
>2 THEN Skip_rest%=1 : = FN_rude
990 s$=FN_intersection(Neg$,in$) : Neg
%=FN_unlist(s$)
1000 s$=FN_intersection(Yes_no$,in$)
1010 IF LEN(s$)>2 THEN = FN_yes_no(FN_h
ead(s$))
1020 key_words$=FN_key_words(in$)
1030 Mentioned$=FN_add_list(key_words$,
Mentioned$)
1040 IF FN_unlist(Mentioned$)>13 THEN M
entioned$=FN_tail(Mentioned$)
1050 question$=FN_intersection(Question
$,in$)
1060 IF LEN(question$)>2 OR Question%=1
THEN Skip_rest%=1 : = FN_question(in$)
1070 = key_words$
1080 :
1090 DEF FN_key_words(in$)
1100 LOCAL key$,sep$,i$
1110 key$="//"
1120 key$=FN_add_list(FN_intersection(F
amily$,in$), key$)
```

Continued ►

◄ *Eliza* continued

```
1130 key$=FN_add_list(FN_intersection(G
ood_feelings$,in$), key$)
1140 key$=FN_add_list(FN_intersection(B
ad_feelings$,in$), key$)
1150 key$=FN_add_list(FN_intersection(I
mportant$,in$), key$)
1160 key$=FN_add_list(FN_intersection(F
riends$,in$), key$)
1170 = key$
1180 :
1190 DEF FN_transform(match$,in$)
1200 LOCAL m%,n%
1210 m%=FN_unlist(match$)
1220 IF (m%=0 AND Exchanges%=0) THEN =
FN_bluff
1230 IF m%=0 THEN = FN_restate(in$)
1240 IF m%>1 THEN r%=RND(m%) ELSE r%=1
1250 w$=L$(r%)
1260 IF FN_member(w$,Family$)>0 THEN =
FN_family(w$)
1270 IF FN_member(w$,Good_feelings$)>0
THEN = FN_good(w$)
1280 IF FN_member(w$,Bad_feelings$)>0 T
HEN = FN_bad(w$)
1290 IF FN_member(w$,Important$)>0 THEN
= FN_important(w$)
1300 IF FN_member(w$,Friends$)>0 THEN =
FN_friends(w$)
1310 = in$
1320 :
1330 DEF FN_greet(w$)
1340 Skip_rest%=1
1350 IF w$="hello" OR w$="hi" THEN w$="
hello" : IF Greet%=0 THEN Greet%=1 : = w
$ ELSE IF w$="hello" THEN = "hello again
"
1360 End%=1 : = "Goodbye, I hope that y
ou will try another session soon"
1370 :
1380 DEF FN_rude
1390 IF Trace% THEN PRINT"RUDE"
1400 r%=RND(10)
1410 Skip_rest%=1
1420 IF r%<6 THEN = "Please remain calm
" ELSE IF r%<9 THEN = "There's no need f
or that sort of language" ELSE = "Don't
swear at me sunshine"
1430 :
1440 DEF FN_bluff
1450 LOCAL n%,previous$
1460 IF Trace% THEN PRINT"BLUFF"
1470 IF FN_unlist(Last$)>0 THEN = L$(2)
1480 n%=RND(15)
1490 IF n%<=3 THEN = "Please go on"
1500 IF n%<=4 THEN End%=1 : = "I'm sorr
y, I have to go now. I hope you have fou
nd our chat helpful"
1510 IF n%<=8 THEN = "/Do you have any
worries about your work?/Tell me about y
our worries./"
1520 IF n%<=10 THEN = "Who are the most
important people in your life?"
1530 m%=FN_unlist(Mentioned$)
1540 IF m%>1 THEN n%=RND(m%) ELSE n%=1
1550 previous$=L$(n%)
1560 IF FN_member(previous$,Bad_feeling
s$) THEN = "Let's go back to your negati
ve emotions:"+CHR$13+CHR$10+"Tell me abo
ut your feeling of "+previous$
1570 = "Please tell me more about your
"+previous$
1580 :
```

Continued ►

◄ *Eliza* continued

```
1590 DEF FN_restate(in$)
1600 LOCAL m%,n%,s%
1610 IF Trace% THEN PRINT "RESTATE"
1620 IF FN_unlist(Last$)>0 THEN = L$(2)
1630 in$=MID$(in$,2,LEN(in$)-2)
1640 IF RND(2)=1 THEN = in$+"?" ELSE =
"why do you say "+in$+"?"
1650 :
1660 DEF FN_family(w$)
1670 IF Trace% THEN PRINT "FAMILY"
1680 r%=RND(5)
1690 IF r%=1 THEN = "Tell me more about
 your "+w$
1700 IF r%=2 THEN = "Tell me more about
 your parents"
1710 IF r%=3 THEN = "/Do you have a lar
ge family?/Who is the closest to you?/"
1720 IF r%=4 THEN = "Is your family ver
y important to you?/Who do you like the
best?"
1730 IF r%=5 THEN = "It's hard to keep
on good terms with everyone"
1740 :
1750 DEF FN_good(w$)
1760 IF Trace% THEN PRINT "GOOD FEELING
S"
1770 IF Neg%=1 THEN Neg%=-1 : = FN_bad(
w$)
1780 = "I am glad to hear it"
1790 :
1800 DEF FN_important(w$)
1810 IF Trace% THEN PRINT "IMPORTANT"
1820 r%=RND(10)
1830 IF r%=1 THEN = "You're right to be
 concerned"
1840 IF r%=2 THEN = "Times are very dif
ficult"
1850 IF r%=3 THEN = "I think the govern
ment is to blame"
1860 IF r%<9 AND w$<>"unemployed" AND w
$<>"need" THEN =."Tell me about your "+w
$
1870 = "How are your family reacting to
 the situation?"
1880 :
1890 DEF FN_friends(w$)
1900 IF Trace% THEN PRINT"FRIENDS"
1910 r%=RND(10)
1920 IF r%<=4 THEN = "What sorts of pro
blems are caused by your "+w$+"?"
1930 IF r%<10 THEN = "How well do your
parents get on with your "+w$+"?"
1940 IF r%=10 THEN = "You can never tel
l how things will turn out"
1950 :
1960 DEF FN_bad(w$)
1970 IF Trace% THEN PRINT "BAD FEELINGS
"
1980 IF Neg%=1 THEN Neg%=-1 : = FN_good
(w$)
1990 r%=RND(10)
2000 IF r%=1 THEN = "Try to think posit
ive!"
2010 IF r%<6 THEN = "/Do your family gi
ve you any support?/Who is the most supp
ortive?/"
2020 = "/Is there anyone who can help y
ou?/Tell me about your friends./"
2030 :
2040 DEF FN_question(w$)
2050 IF Trace% THEN PRINT "QUESTION"
2060 r%=RND(10)
```

Continued ►

◄ *Eliza* continued

```
2070 IF r%<3 THEN = "What do you think?
"
2080 IF r%<6 OR (r%<8 AND Exchanges%>1)
 THEN = "What do you mean - '"+w$+"'?"
2090 = "Why do you want to know?"
2100 :
2110 DEF FN_yes_no(w$)
2120 IF Trace% THEN PRINT "YES_NO"
2130 Skip_rest%=1
2140 IF w$<>"yes" AND w$<>"no" THEN = "
/Why aren't you sure?/Why is this import
ant to you?/"
2150 IF FN_unlist(Last$)>1 THEN = L$(2)
2160 = "What do you mean - "+w$+"?"
2170 :
2180 DEF PROC_print(xtab,ytab,out$)
2190 IF LEFT$(out$,1)<>" " THEN out$="
"+out$
2200 IF RIGHT$(out$,1)<>" " THEN out$=o
ut$+" "
2210 m%=FN_unlist(out$)
2220 out$="" : len%=xtab-1
2230 FOR n%=1 TO m%
2240 len%=len%+LEN(L$(n%))+1
2250 IF len%>40 THEN len%=LEN(L$(n%)) :
 L$(n%)=CHR$8+CHR$13+CHR$10+L$(n%)
2260 IF len%=40 THEN len%=0 : L$(n%+1)=
CHR$8+L$(n%+1)
2270 NEXT
2280 out$=FN_enlist(m%," ")
2290 out$=MID$(out$,2,LEN(out$)-2)
2300 IF ytab>-1 THEN PRINT TAB(xtab,yta
b);out$ ELSE PRINT TAB(xtab);out$
2310 ENDPROC
```

See Joe's Jottings, page 96

Listing 1. *AQUONI* header program

```
 10 REM AQUONI Header
 20 REM By Joe Telford 1987
 30 REM For BBC B/B+/M/C/E
 40 REM (c) Acorn User  March 1987
 50 :
 60 MODE2
 70 DIM c% 9,name$(4)
 80 VDU 23,1;0;0;0;0
 90 PROCvalid
100 L%=FNsetlevel
110 PROCscreen(L%)
120 N%=FNname
130 FOR x%=1 TO N%
140 $(&900+x%*10)=name$(x%)
150 NEXT
160 CHAIN "AQUONI3"
170 END
180 :
190 DEF FNsetlevel
200 LOCAL A,dummy
210 COLOUR132 : CLS : COLOUR3
220 PRINTTAB(1,1); : PROCd("A")
230 PRINTTAB(1,4); : PROCd("QU") : COL
OUR2 : PROCd("estion") : COLOUR3
240 PRINTTAB(1,7); : PROCd("O") : COLO
UR2 : PROCd("f") : COLOUR3
250 PRINTTAB(1,10); : PROCd("N") : COL
OUR2 : PROCd("o") : COLOUR3
260 PRINTTAB(1,13); : PROCd("I") : COL
OUR2 : PROCd("mportance") : COLOUR3
270 PRINTTAB(1,18); : PROCd("A Q U O N
 I") : COLOUR 6
```

Continued ►

◄ *AQUONI* listing 1 continued

```
280 PRINTTAB(0,23); : PROCd("(c) 1987 Joe Telford")
290 dummy=INKEY(500)
300 PROCcqa
310 PRINTTAB(1,23); : PROCd("Select Level 0-2 :")
320 REPEAT
330 A=GET
340 UNTIL A>47 AND A<51
350 PROCd(CHR$A)
360 dummy=INKEY(300)
370 PROCcqa
380 = A-48
390 :
400 DEF PROCscreen(L%)
410 a$=CHR$132
420 VDU23,132,24,60,60,129,126,60,16,127
430 VDU23,133,0,0,0,24,24,0,0,0
440 VDU23,134,3,3,0,0,0,0,192,192
450 VDU23,135,3,3,0,24,24,0,192,192
460 VDU23,136,195,195,0,0,0,0,195,195
470 VDU23,137,195,195,0,24,24,0,195,195,
480 VDU23,138,195,195,0,195,195,0,195,195
490 VDU23,139,16,56,84,16,16,16,16,16
500 VDU23,140,15,3,5,9,16,32,64,128
510 VDU23,141,0,4,2,255,2,4,0,0
520 VDU23,142,128,64,32,16,9,5,3,15
530 VDU23,143,16,16,16,16,16,84,56,16
540 VDU23,144,1,2,4,8,144,160,192,240
550 VDU23,145,0,32,64,255,64,32,0,0
560 VDU23,146,240,192,160,144,8,4,2,1
570 COLOUR132 : COLOUR 3
580 PRINT TAB(0,0) : PROCd(" "+CHR$132+"AQUONI"+CHR$132+" S D  R G")
590 FOR Y= 2 TO 16 STEP 4
600 FOR Z=0 TO 3
610 PRINT TAB(0,2+Y+Z);
620 FOR X= 0 TO 12 STEP 2
630 COLOUR 137+((X/2+(Y-4)/2)+16)MOD 7 : PRINT"  ";
640 NEXT,,
650 FOR X=9 TO 15
660 IF L%=0 VDU19,X,X-8;0;0;0;
670 IF L%>0 VDU19,X,0;0;0;0;
680 NEXT
690 ENDPROC
700 :
710 DEFPROCcqa
720 COLOUR RND(7)+128 : PRINT TAB(0,0);
730 FOR x= 1 TO 11
740 SOUND&11,-10,100-x*4,1 : PRINTCHR$11; : t=TIME+5
750 REPEAT UNTIL TIME>t
760 NEXT
770 COLOUR 128 : PRINT TAB(0,31);
780 FOR x= 1 TO 11
790 PRINT : SOUND&11,-10,56+x*4,1 : t=TIME+5
800 REPEAT UNTIL TIME>t
810 NEXT
820 ENDPROC
830 :
840 DEF PROCd(x$)
850 LOCAL x%
860 FOR x%=1 TO LENx$
870 PROCdh(MID$(x$,x%,1))
880 NEXT
890 ENDPROC
900 :
```

Continued ►

◄ *AQUONI* listing 1 continued

```
910 DEF PROCdh(a$)
920 ?c%=ASCa$ : X%=c%MOD256 : Y%=c%DIV256
930 A%=10 : CALL&FFF1
940 VDU23,128,c%?1,c%?1,c%?2,c%?2,c%?3,c%?3,c%?4,c%?4,128,10,8,23,128,c%?5,c%?5,c%?6,c%?6,c%?7,c%?7,c%?8,c%?8,128,11
950 ENDPROC
960 :
970 DEFFNname
980 LOCALn,loop% : COLOUR133 : COLOUR6
990 COLOUR128 : COLOUR3
1000 PRINT TAB(0,22); : PROCd("Type each name then")
1010 PRINT TAB(0,25); : PROCd("press RETURN. To end")
1020 PRINT TAB(0,28); : PROCd("Press RETURN again.")
1030 COLOUR133 : COLOUR6
1040 n=0
1050 REPEAT
1060 n=n+1
1070 REPEAT
1080 PRINT TAB(14,2+n*4); : name$(n)=FNgpi(6,3,cap$+low$)
1090 UNTIL name$(1)>""
1100 UNTIL (name$(n)="" AND n>1) OR n=4
1110 FOR x= 1 TO 4
1120 COLOUR128 : PRINT TAB(14,x*4); : PROCd("      "):
1130 PRINT TAB(14,2+x*4); : COLOUR 133 : PROCd("      ")
1140 PRINT TAB(14,2+x*4); : COLOUR 6 : IF name$(x)>"" THEN PROCd(name$(x))
1150 NEXT
1160 IF n=4 AND name$(4)>"" THEN n=5
1170 PROCcqa
1180 = n-1
1190 :
1200 DEF FNgpi(len,effect,valid$)
1210 LOCALa$,b
1220 a$=""
1230 PROCd(STRING$(len,".")) : PRINT STRING$(len,CHR$(8)); : *FX15,1
1240 b=GET : IF b=13 THEN = a$
1250 IF b=127 AND a$="" THEN 1240
1260 IF b=127 a$=LEFT$(a$,LEN(a$)-1) : VDU127 : PROCd(".") : VDU8 : GOTO1240
1270 IF effect=0 THEN 1300
1280 IF effect=1 b=b AND 223 ELSE b=b OR32
1290 IF effect=3 AND(RIGHT$(a$,1)=" " OR a$="") b=b AND 223
1300 IF LEN(a$)=len OR INSTR(valid$,CHR$b)=0 THEN VDU7 : GOTO1240
1310 PROCd(CHR$b) : a$=a$+CHR$b : GOTO1240
1320 :
1330 DEF PROCvalid
1340 cap$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
1350 low$="abcdefghijklmnopqrstuvwxyz"
1360 ENDPROC
```

Listing 2. Template program to build data file

```
10 REM Template Program to build up Datafile for AQUONI
20 REM By Joe Telford
30 REM For BBC B/B+/M/C
40 REM (c) Acorn User  March 1987
50 :
```

Continued ►

◀ *AQUONI* listing 2 continued

```
   60 CLOSE #0
   70 MODE 3
   80 file$="RED"
   90 PRINT "Creating ";file$;" file for
 AQUONI....Please wait!"
  100 channel=OPENOUT(file$)
  110 reclength=200
  120 RESTORE
  130 READ no_of_items
  140 PRINT#channel,no_of_items
  150 FOR item=1 TO no_of_items
  160 PTR#channel=item*reclength
  170 READ q$ : IF LENq$>80 THEN PRINT q
$'"Warning > 80"
  180 IF LENq$>100 THEN PRINT "also > 10
0.....cutting!"
  190 q$=LEFT$(q$,100) : q$=q$+STRING$(1
00-LENq$," ")
  200 PRINT#channel,q$
  210 FOR ans=1TO 4
  220 READ an$ : IF LENan$>20 THEN PRINT
 an$"....Warning > 20.....cutting"
  230 an$=LEFT$(an$,20) : an$=an$+STRING
$(20-LENan$," ")
  240 PRINT#channel,an$
  250 NEXT ans
  260 READcorrect
  270 IF correct<1 OR correct>4 THEN PRO
Cabort
  280 PRINT#channel,correct
  290 NEXT item
  300 CLOSE#0
  310 PRINT file$;" file created."
  320 END
  330 :
  340 DEF PROCabort
  350 PRINT '"Data fault :"'q$
  360 PRINT "has correct answer ";correc
t
  370 PRINT "File creation Aborted"
  380 CLOSE#channel
  390 END
  400 :
  410 REM RED Q/A's .....TV Puppets
  420 DATA 5 : REM No of questions
  430 DATA What space ship was launched
from space city?
  440 DATA Enterprise,Fireball XL5,Liber
ator,Tardis,2
  450 DATA What thunderbird came out of
the round house?
  460 DATA 1,2,3,4,3
  470 DATA Who was Lady Penelope's butle
r?
  480 DATA Parker,Benson,Philips,Sid,1
  490 DATA Who piloted Supercar?
  500 DATA Eric Earth,Joe Jupiter,Mike M
ercury,Sam Saturn,3
  510 DATA Who was the Spectrum Mysteron
 Agent?
  520 DATA Captain Scarlet,Captain Blue,
Captain White,Captain Black,4
```

Listing 3. Main program with files

```
   10 REM AQUONI main game-With Files
   20 REM By Joe Telford
   30 REM Packed version: Not to AU styl
e
   40 REM (c) Acorn User  March 1987
   50 :
```

Continued ▶

◀ *AQUONI* listing 3 continued

```
   60 DIM c% 9,name$(4),p(4,2),colour(4)
,score(4,6),an$(4),file$(6)
   70 PROCstartup:nos=FNname:v=1
   80 IF nos=1 n=1 ELSE n=RND(-TIME):FOR
 x= 1 TO 10:n=RND(nos):PROCgo(n):PROCend
go(n):NEXT
   90 REPEAT
  100 n=((n+1) MOD (nos+1)):IF n=0 n=1
  110 PROCgo(n):dice=FNdice
  120 dr=FNrotate:PROCmove(n,dice)
  130 PROCgiveQ(colour(n)MOD 8)
  140 score(n,0)=score(n,0)+FNanswer(n)
  150 PROCendgo(n)
  160 UNTILscore(n,0)=6
  170 PROCwinner:END
  180 :
  190 DEF PROCwinner
  200 PROCcqa("The Winner is "+name$(n))
  210 COLOUR7:COLOUR128
  220 PRINTTAB(2,26);:PROCd("SPACE to re
play")
  230 REPEAT A$=GET$
  240 UNTIL A$=" "
  250 CHAIN"AQUONI"
  260 :
  270 DEF PROCmove(n,d)
  280 FOR loop%=1 TO d
  290 PROCposition(n)
  300 IFL%=1 VDU19,colour(n),0,0;0;0;
  310 PROCstep(n)
  320 PROCposition(n)
  330 IFL%=1 colour(n)=POINT(px,py):VDU1
9,colour(n),colour(n)-8,0;0;0;
  340 SOUND1,-10*v,150,2
  350 t=TIME+30:REPEAT UNTIL TIME>t
  360 NEXT
  370 colour(n)=POINT(px,py)
  380 ENDPROC
  390 :
  400 DEF PROCstep(n)
  410 REPEAT
  420 se=8
  430 IF dr<=1 OR dr=7 p(n,2)=p(n,2)+1
  440 IF dr>=1 AND dr<=3 p(n,1)=p(n,1)+1
  450 IF dr>=3 AND dr<=5 p(n,2)=p(n,2)-1
  460 IF dr>=5 AND dr<=7 p(n,1)=p(n,1)-1
  470 PROCck(n)
  480 IF se<>8 dr=se
  490 UNTIL se=8
  500 ENDPROC
  510 :
  520 DEF PROCck(n)
  530 IF p(n,1)>6 AND p(n,2)>3 AND dr= 1
 p(n,1)=6:p(n,2)=3:se=5
  540 IF p(n,1)>6 AND p(n,2)<0 AND dr= 3
 p(n,1)=6:p(n,2)=0:se=7
  550 IF p(n,1)<0 AND p(n,2)>3 AND dr= 7
 p(n,1)=0:p(n,2)=3:se=3
  560 IF p(n,1)<0 AND p(n,2)<0 AND dr= 5
 p(n,1)=0:p(n,2)=0:se=1
  570 IF p(n,1)>6 AND dr=2 p(n,1)=6:se=6
  580 IF p(n,1)>6 AND dr=1 p(n,1)=6:p(n,
2)=p(n,2)-1:se=7
  590 IF p(n,1)>6 AND dr=3 p(n,1)=6:p(n,
2)=p(n,2)+1:se=5
  600 IF p(n,1)<0 AND dr=6 p(n,1)=0:se=2
  610 IF p(n,1)<0 AND dr=5 p(n,1)=0:p(n,
2)=p(n,2)+1:se=3
  620 IF p(n,1)<0 AND dr=7 p(n,1)=0:p(n,
2)=p(n,2)-1:se=1
  630 IF p(n,2)>3 AND dr=0 p(n,2)=3:se=4
  640 IF p(n,2)>3 AND dr=1 p(n,2)=3:p(n,
```

Continued ▶

◀ ***AQUONI*** **listing 3 continued**

```
1)=p(n,1)-1:se=3
  650 IF p(n,2)>3 AND dr=7 p(n,2)=3:p(n,
1)=p(n,1)+1:se=5
  660 IF p(n,2)<0 AND dr=4 p(n,2)=0:se=0
  670 IF p(n,2)<0 AND dr=3 p(n,2)=0:p(n,
1)=p(n,1)-1:se=1
  680 IF p(n,2)<0 AND dr=5 p(n,2)=0:p(n,
1)=p(n,1)+1:se=7
  690 ENDPROC
  700 :
  710 DEF PROCstartup
  720 a$=CHR$132
  730 FORx=1TO 4:score(x,0)=0:colour(x)=
137:FORy=1 TO 2:p(x,y)=0:NEXT,
  740 RESTORE:FORx=1TO6:READfile$(x):NEX
T
  750 ENDPROC
  760 :
  770 DEF PROCcqa(m$)
  780 COLOUR RND(7)+128:PRINTTAB(0,0);:F
OR x= 1 TO 11:SOUND&11,-10*v,100-x+4,1:P
RINTCHR$11;:t=TIME+5:REPEAT UNTIL TIME>t
:NEXT
  790 COLOURO:IF m$>"" PRINTTAB((10-(LEN
m$)/2),4);:PROCd(m$):dummy=INKEY(200)
  800 COLOUR128:PRINTTAB(0,31);:FOR x= 1
 TO 11:PRINT:SOUND&11,-10*v,56+x*4,1:t=T
IME+5:REPEAT UNTIL TIME>t:NEXT
  810 ENDPROC
  820 :
  830 DEF FNrotate
  840 LOCALA$
  850 COLOUR132:COLOUR3
  860 REPEAT
  870 PROCsd(15,1," ",30,52,-10)
  880 PROCsd(15,1,"R",30,52,0)
  890 A$=CHR$(INKEY(0) AND 223):IF A$="S
" v=1-v
  900 UNTIL A$="R"
  910 dr=-1:REPEATdr=(dr+1)MOD8
  920 PROCsd(15,1,CHR$(139+dr),15,52,-10
)
  930 A$=CHR$(GET AND 223)
  940 IF A$="S" v=1-v
  950 UNTIL A$="G"
  960 =dr
  970 :
  980 DEF FNdice:LOCALA$
  990 COLOUR132:COLOUR3
 1000 REPEAT
 1010 PROCsd(12,1," ",30,0,-10)
 1020 PROCsd(12,1,"D",30,0,0)
 1030 A$= CHR$(INKEY(0) AND 223):IF A$="
S" v=1-v
 1040 UNTIL A$="D"
 1050 FOR X= 1 TO 20+RND(30)
 1060 dice=RND(6)
 1070 PROCsd(12,1,CHR$(132+dice),10,0,-1
5)
 1080 NEXT
 1090 =dice
 1100 :
 1110 DEF PROCsd(x,y,d$,d,p,vol)
 1120 SOUND1,vol*v,p,d/15
 1130 t=TIME+d:REPEAT UNTIL TIME>t
 1140 PRINTTAB(x,y);:PROCd(d$)
 1150 ENDPROC
 1160 :
 1170 DEF PROCgo(n)
 1180 COLOUR 134:COLOUR5:PRINTTAB(14,2+n
*4);:PROCd("        ")
 1190 PRINTTAB(14,2+n*4);:PROCd(name$(n)
)
```

Continued ▶

◀ ***AQUONI*** **listing 3 continued**

```
 1200 ENDPROC
 1210 :
 1220 DEF PROCendgo(n)
 1230 COLOUR 133:COLOUR6:PRINTTAB(14,2+n
*4);:PROCd("        ")
 1240 PRINTTAB(14,2+n*4);:PROCd(name$(n)
)
 1250 ENDPROC
 1260 :
 1270 DEF FNname
 1280 FOR x%=1 TO N%
 1290 name$(x%)=$(&900+x%*10)
 1300 PROCposition(x%)
 1310 NEXT
 1320 =N%
 1330 :
 1340 DEF PROCposition(n%)
 1350 GCOL4,0:VDU5
 1360 IF n%=1 px=p(1,1)*128:py=p(1,2)*12
8+504:MOVEpx,py:PROCd("1")
 1370 IF n%=2 px=p(2,1)*128:py=p(2,2)*12
8+440:MOVEpx,py:PROCd("2")
 1380 IF n%=3 px=p(3,1)*128+64:py=p(3,2)
*128+504:MOVEpx,py:PROCd("3")
 1390 IF n%=4 px=p(4,1)*128+64:py=p(4,2)
*128+440:MOVEpx,py:PROCd("4")
 1400 VDU4
 1410 ENDPROC
 1420 :
 1430 DEF PROCd(s$)
 1440 LOCALx%
 1450 FORx%=1 TO LENs$
 1460 ?c%=ASC(MID$(s$,x%,1)):X%=c%MOD256
:Y%=c%DIV256:A%=10:CALL&FFF1
 1470 VDU23,128,c%?1,c%?1,c%?2,c%?2,c%?3
,c%?3,c%?4,c%?4,128,10,8,23,128,c%?5,c%?
5,c%?6,c%?6,c%?7,c%?7,c%?8,c%?8,128,11
 1480 NEXT
 1490 ENDPROC
 1500 :
 1510 DEF PROCprq
 1520 COLOUR128:COLOUR7:PRINTTAB(0,21);
 1530 chrs=0:p1=0:REPEAT w$=FNgetword:qu
$=RIGHT$(w$,1):w$=LEFT$(w$,20)
 1540 IF(chrs+LENw$)<=20 PROCd(w$):chrs=
chrs+LENw$:w$="":IF chrs<20 PROCd(" "):c
hrs=chrs+1
 1550 IF chrs>=20 PRINT :chrs=0
 1560 IF (chrs+LENw$)>=20 AND w$<>"" PRI
NT':PROCd(w$):chrs=LENw$:IF chrs<20 PROC
d(" "):chrs=chrs+1
 1570 IF chrs>=20 chrs=0
 1580 UNTIL qu$="?"
 1590 COLOUR colr+128:COLOURO:PRINTTAB(0
,31);"Press a Cursor key";
 1600 ENDPROC
 1610 :
 1620 DEF FNgetword
 1630 LOCALA$
 1640 A$=""
 1650 REPEAT p1=p1+1:UNTIL MID$(q$,p1,1)
<>" ":p2=p1
 1660 REPEAT p2=p2+1: UNTIL MID$(q$,p2,1
)=" " OR MID$(q$,p2,1)="?" OR p2=255
 1670 A$=MID$(q$,p1,p2-p1):p1=p2-1
 1680 IF MID$(q$,p2,1)="?" A$=A$+"?"
 1690 IF p2=255 A$=A$+"?"
 1700 =A$
 1710 :
 1720 DEF PROCwrong(n)
 1730 PROCcqa("Sorry "+name$(n))
 1740 ENDPROC
 1750 :
```

Continued ▶

◄ *AQUONI* listing 3 continued

```
1760 DEF FNwelldone(n)
1770 PROCcqa("Well done "+name$(n))
1780 IF (colour(n) MOD8)=7 AND score(n,
colr)=0 THEN score(n,colr)=1:PROCupscore
(n):=1
1790 =0
1800 :
1810 DEF PROCupscore(n)
1820 PRINTTAB(14,0+4*n);
1830 FORx=1TO6:COLOURx
1840 IFscore(n,x)=1 PROCd(CHR$132):ELSE
PROCd(" ")
1850 NEXT
1860 ENDPROC
1870 :
1880 DEF FNchoosecol
1890 LOCALc,C$
1900 PRINTTAB(0,22);:COLOUR128:COLOUR7:
PROCd("Use SPACE to select")
1910 PRINTTAB(1,24);:PROCd("question co
lour:")
1920 REPEAT
1930 c=0:REPEAT c=c+1:IF c=7 THEN c=1
1940 COLOURc+128:PRINTTAB(0,27);STRING$
(60," ")
1950 C$=INKEY$(200)
1960 UNTIL C$=" "
1970 UNTIL score(n,c)=0
1980 PROCcqa("")
1990 =c
2000 :
2010 REM PROGRAM QUESTIONS TYPE 3
2020 DATA RED,GREEN,YELLOW,BLUE,PURPLE,
CYAN
2030 :
2040 DEF PROCgiveQ(c):LOCALx,y
2050 colr=c:IF c=7 colr=FNchoosecol
2060 ch%=OPENUP(file$(colr)):INPUT#ch%,
quests
2070 qno=RND(quests):PTR#ch%=qno*200
2080 INPUT#ch%,q$:FOR y=1 TO 4:INPUT#ch
%,an$(y):NEXT:INPUT#ch%,cor
2090 CLOSE#ch%:PROCprq:ENDPROC
2100 :
2110 DEF FNanswer(n)
2120 *FX4,1
2130 REPEAT
2140 REPEAT key=GET:UNTIL key=138 OR ke
y=139
2150 PROCcqa("")
2160 COLOURcolr+128:COLOUR 0:PRINTTAB(0
,30);:PROCd("Cursor, Return, Q")
2170 COLOUR128:COLOUR7:p=1:PROCprintans
(p)
2180 REPEAT:key=GET
2190 IF CHR$(key AND 223)="Q" PROCcqa("
"):PROCprq:UNTILTRUE:UNTIL0
2200 IF key=139 p=p-1:IF p=0 p=4
2210 IF key=138 p=p+1:IF p=5 p=1
2220 IF key<>13 PROCprintans(p)
2230 UNTIL key=13
2240 UNTILTRUE
2250 IF p<>cor PROCwrong(n):=0
2260 =FNwelldone(n)
2270 :
2280 DEF PROCprintans(p):LOCALx
2290 FOR x=1 TO 4:PRINTTAB(0,19+x*2);
2300 IF p=x COLOUR135:COLOUR0 ELSE COLO
UR128:COLOUR7
2310 PROCd(an$(x)):COLOUR128:COLOUR7
2320 NEXT
2330 ENDPROC
```

Listing 4. Main game minimal version

```
10 REM AQUONI main game Minimal versi
on
60 DIM c% 9,name$(4),p(4,2),colour(4)
,score(4,6),an$(4)
710 DEF PROCstartup
720 a$=CHR$132
730 FORx=1TO 4:score(x,0)=0:colour(x)=
137:FORy=1 TO 2:p(x,y)=0:NEXT,
740 ENDPROC
2000 :
2010 REM PROGRAM QUESTIONS TYPE 1
2020 :
2030 DEF PROCgiveQ(c):LOCALx,y
2040 colr=c:IF c=7 colr=FNchoosecol
2050 RESTORE
2060 FOR x=1 TO colr:READdataline:NEXT
2070 RESTORE dataline
2080 READ quests:qno=RND(quests)
2090 FOR x=1 TO qno:READq$:an$(2)="I wa
s right         ":an$(1)="I was wrong
   ":NEXT
2100 PROCprq
2110 ENDPROC
2120 :
2130 DEF FNanswer(n)
2140 *FX4,1
2150 REPEAT
2160 REPEAT key=GET:UNTIL key=138 OR ke
y=139
2170 PROCcqa("")
2180 COLOURcolr+128:COLOUR 0:PRINTTAB(0
,30);:PROCd("Cursor, Return, Q")
2190 COLOUR128:COLOUR7:p=1:PROCprintans
(p)
2200 REPEAT:key=GET
2210 IF CHR$(key AND 223)="Q" PROCcqa("
"):PROCprq:UNTILTRUE:UNTIL0
2220 IF key=139 p=p-1:IF p=0 p=2
2230 IF key=138 p=p+1:IF p=3 p=1
2240 IF key<>13 PROCprintans(p)
2250 UNTIL key=13
2260 UNTILTRUE
2270 IF p<>2 PROCwrong(n):=0
2280 =FNwelldone(n)
2290 :
2300 DEF PROCprintans(p):LOCALx
2310 FOR x=1 TO 2:PRINTTAB(0,19+x*2);
2320 IF p=x COLOUR135:COLOUR0 ELSE COLO
UR128:COLOUR7
2330 PROCd(an$(x)):COLOUR128:COLOUR7
2340 NEXT:ENDPROC
2350 :
2360 DATA 2400,2480,2560,2640,2720,2800
2370 REM Q/As stored in DATA
2380 :
2390 REM RED Q/A's .....TV Puppets
2400 DATA 5 : REM No of questions
2410 DATA What space ship was launched
from space city?
2420 DATA What thunderbird came out of
the round house?
2430 DATA Who was Lady Penelope's butle
r?
2440 DATA Who piloted Supercar?
2450 DATA Who was the Spectrum Mysteron
Agent?
2460 :
2470 REM GREEN Q/A's .....General Knowl
edge
2480 DATA 5 : REM No of questions
2490 DATA Who recently resigned as vice
chairman of the Torys?
```

Continued ►

◀ *AQUONI* listing 4 continued

```
 2500 DATA Who got lost in the Sahara De
sert?
 2510 DATA How high is the dome of St. P
aul's cathedral?
 2520 DATA Who was the second man on the
 moon?
 2530 DATA Who is the Duke of York?
 2540 :
 2550 REM YELLOW Q/A's .....Films
 2560 DATA 5 : REM No of questions
 2570 DATA Who played Mr. Smith and went
 to Washington?
 2580 DATA Who stared with John Travolta
 in Grease?
 2590 DATA What film had Panama in it's
Cellar?
 2600 DATA What was the name of the fury
 Gremlin?
 2610 DATA What film was Dan Acykroyd in
 before Ghostbusters?
 2620 :
 2630 REM BLUE Q/A's .....TV Soaps
 2640 DATA 5 : REM No of questions
 2650 DATA What is the name of Ethel's d
og in Eastenders?
 2660 DATA What series featured Gary Ewi
ng?
 2670 DATA Who was the poison dwarf?
 2680 DATA What soap butler has his own
series?
 2690 DATA Who was Jill Chances first hu
sband?
 2700 :
 2710 REM PURPLE Q/A's .....Computers
 2720 DATA 5 : REM No of questions
 2730 DATA Who is the Canadian chairman
of Acorn?
 2740 DATA How many books has Bruce Smit
h written?
 2750 DATA Who recently left Acorn User?
 2760 DATA What was Clive Sinclair's fir
st Computer?
 2770 DATA How many computers have Acorn
 realeased?
 2780 :
 2790 REM CYAN Q/A's .....Pop
 2800 DATA 5 : REM No of questions
 2810 DATA Which record was number 1 the
 longest?
 2820 DATA What band was Trevor Horn lea
d singer with?
 2830 DATA Who danced on the ceiling?
 2840 DATA Who is Harry Webb better know
n as?
 2850 DATA Who did Jimmy Sommerville sin
g with before the Communards?
```

Listing 5. Main game, Master plus cassette

```
   10 REM AQUONI main game Master + Cass
ette
   20 DIM c% 9,name$(4),p(4,2),colour(4)
,score(4,6),an$(4)
   30 DIM c% 9,name$(4),p(4,2),colour(4)
,score(4,6),an$(4)
  710 DEFPROCstartup
  720 a$=CHR$132
  730 FORx=1TO 4:score(x,0)=0:colour(x)=
137:FORy=1 TO 2:p(x,y)=0:NEXT,
  740 ENDPROC
```

Continued ▶

AQUONI listing 5 continued

```
 2000 :
 2010 REM PROGRAM QUESTIONS TYPE 1
 2030 DEFPROCgiveQ(c):LOCALx,y
 2040 colr=c:IF c=7 colr=FNchoosecol
 2050 RESTORE
 2060 FOR x=1 TO colr:READdataline:NEXT
 2070 RESTORE dataline
 2080 READ quests:qno=RND(quests)
 2090 FOR x=1 TO qno:READq$:FOR y=1 TO 4
:READan$(y):an$(y)=LEFT$(an$(y),20):an$(
y)=an$(y)+STRING$(20-LENan$(y)," "):NEXT
:READcor:NEXT
 2100 PROCprq
 2110 ENDPROC
 2130 DEFFNanswer(n)
 2140 *FX4,1
 2150 REPEAT
 2160 REPEAT key=GET:UNTIL key=138 OR ke
y=139
 2170 PROCcqa("")
 2180 COLOURcolr+128:COLOUR 0:PRINTTAB(0
,30);:PROCd("Cursor, Return, Q")
 2190 COLOUR128:COLOUR7:p=1:PROCprintans
(p)
 2200 REPEAT:key=GET
 2210 IF CHR$(key AND 223)="Q" PROCcqa("
"):PROCprq:UNTILTRUE:UNTILO
 2220 IF key=139 p=p-1:IF p=0 p=4
 2230 IF key=138 p=p+1:IF p=5 p=1
 2240 IF key<>13 PROCprintans(p)
 2250 UNTIL key=13
 2260 UNTILTRUE
 2270 IF p<>cor PROCwrong(n):=0
 2280 =FNwelldone(n)
 2300 DEFPROCprintans(p):LOCALx
 2310 FOR x=1 TO 4:PRINTTAB(0,19+x*2);
 2320 IF p=x COLOUR135:COLOURO ELSE COLO
UR128:COLOUR7
 2330 PROCd(an$(x)):COLOUR128:COLOUR7
 2340 NEXT:ENDPROC
 2360 DATA 2400,2530,2660,2790,2920,3050
 2370 REM Q/As stored in DATA
 2380 :
 2390 REM RED Q/A's .....TV Puppets
 2400 DATA 5 : REM No of questions
 2410 DATA What space ship was launched
from space city?
 2420 DATA Enterprise,Fireball XL5,Liber
ator,Tardis,2
 2430 DATA What thunderbird came out of
the round house?
 2440 DATA 1,2,3,4,3
 2450 DATA Who was Lady Penelope's butle
r?
 2460 DATA Parker,Benson,Philips,Sid,1
 2470 DATA Who piloted Supercar?
 2480 DATA Eric Earth,Joe Jupiter,Mike M
ercury,Sam Saturn,3
 2490 DATA Who was the Spectrum Mysteron
 Agent?
 2500 DATA Captain Scarlet,Captain Blue,
Captain White,Captain Black,4
 2510 :
 2520 REM GREEN Q/A's .....General Knowl
edge
 2530 DATA 5 : REM No of questions
 2540 DATA Who recently resigned as vice
 chairman of the Torys?
 2550 DATA Geofrey Archer,Norman Tebbit,
Keith Joeseph,Norman Fowler,1
 2560 DATA Who got lost in the Sahara De
sert?
```

Continued ▶

◀ *AQUONI* listing 5 continued

```
2570 DATA Prince Andrew,Prince Edward,M
ark Thatcher,Geofrey Archer,3
2580 DATA How high is the dome of St. P
aul's cathedral?
2590 DATA 143 ft,256 ft,312 ft,365 ft,4
2600 DATA Who was the second man on the
moon?
2610 DATA Neil Armstrong,Buzz Aldrin,Al
an Sheppard,Chuck Yaeger,2
2620 DATA Who is the Duke of York?
2630 DATA Prince Philip,Prince Edward,P
rince Charles,Prince Andrew,4
2640 :
2650 REM YELLOW Q/A's .....Films
2660 DATA 5 : REM No of questions
2670 DATA Who played Mr. Smith and went
 to Washington?
2680 DATA Cary Grant,Michael Caine,Jame
s Stewart,Robert De'niro,3
2690 DATA Who stared with John Travolta
 in Grease?
2700 DATA Cissy Spacek,Olivia Newton-Jo
hn,Ginger Rodgers,Meryl Streep,2
2710 DATA What film had Panama in it's
Cellar?
2720 DATA Arsnic and old lace,The 39 st
eps,The Howling,Psycho,1
2730 DATA What was the name of the fury
 Gremlin?
2740 DATA Stripe,Gizmo,Poddle,Cuddles,2
2750 DATA What film was Dan Acykroyd in
 before Ghostbusters?
2760 DATA Trading Places,Porkys,Gremlin
s,Stripes,4
2770 :
2780 REM BLUE Q/A's .....TV Soaps
2790 DATA 5 : REM No of questions
2800 DATA What is the name of Ethel's d
og in Eastenders?
2810 DATA Willy,Vicky,Rover,Roley,1
2820 DATA What series featured Gary Ewi
ng?
2830 DATA Dallas,Knotts Landing,Falcon
Crest,Dynasty,2
2840 DATA Who was the poison dwarf?
2850 DATA JR,Pam Ewing,Alexis,Lucy Ewin
g,4
2860 DATA What soap butler has his own
series?
2870 DATA Benson,George,Parker,Buttons,
1
2880 DATA Who was Jill Chances first hu
sband?
2890 DATA Jim Lowe,Pete Beale,Stan Harv
ey,Joe Soap,3
2900 :
2910 REM PURPLE Q/A's .....Computers
2920 DATA 5 : REM No of questions
2930 DATA Who is the Canadian chairman
of Acorn?
2940 DATA Brian Long,Hermann Hauser,Chr
is Curry,Bruce Smith,1
2950 DATA How many books has Bruce Smit
h written?
2960 DATA 5,14,18,22,3
2970 DATA Who recently left Acorn User?
2980 DATA Tony Quinn,David Atherton,Dav
id Acton,Colette Curley,3
2990 DATA What was Clive Sinclair's fir
st Computer?
3000 DATA ZX80,QL,Spectrum,MK14,4
3010 DATA How many computers have Acorn
 realeased?
```

Continued ▶

◀ *AQUONI* listing 5 continued

```
3020 DATA 5,10,15,20,3
3030 :
3040 REM CYAN Q/A's .....Pop
3050 DATA 5 : REM No of questions
3060 DATA Which record was number 1 the
 longest?
3070 DATA Mull of Kintyre,White Christm
as,Feed the World,Jingle Bells,2
3080 DATA What band was Trevor Horn lea
d singer with?
3090 DATA Buggles,Queen,10CC,The four s
easons,1
3100 DATA Who danced on the ceiling?
3110 DATA Stevie Wonder,Lionel Ritchie,
Peter Cetera,Howard Jones,2
3120 DATA Who is Harry Webb better know
n as?
3130 DATA Boy George,Elton John,Cliff R
ichard,Paul Young,3
3140 DATA Who did Jimmy Sommerville sin
g with before the Communards?
3150 DATA Soft Cell,The WHO,The special
s,Bronski Beat,4
```

Listing 6. Blue questions and answers

```
410 REM BLUE Q/A's .....TV Soaps
420 DATA 5 : REM No of questions
430 DATA What is the name of Ethel's d
og in Eastenders?
440 DATA Willy,Vicky,Rover,Roley,1
450 DATA What series featured Gary Ewi
ng?
460 DATA Dallas,Knotts Landing,Falcon
Crest,Dynasty,2
470 DATA Who was the poison dwarf?
480 DATA JR,Pam Ewing,Alexis,Lucy Ewin
g,4
490 DATA What soap butler has his own
series?
500 DATA Benson,George,Parker,Buttons,
1
510 DATA Who was Jill Chances first hu
sband?
520 DATA Jim Lowe,Pete Beale,Stan Harv
ey,Joe Soap,3
```

Listing 7. Yellow questions and answers

```
410 REM YELLOW Q/A's .....Films
420 DATA 5 : REM No of questions
430 DATA Who played Mr. Smith and went
 to Washington?
440 DATA Cary Grant,Michael Caine,Jame
s Stewart,Robert De'niro,3
450 DATA Who stared with John Travolta
 in Grease?
460 DATA Cissy Spacek,Olivia Newton-Jo
hn,Ginger Rodgers,Meryl Streep,2
470 DATA What film had Panama in it's
Cellar?
480 DATA Arsnic and old lace,The 39 st
eps,The Howling,Psycho,1
490 DATA What was the name of the fury
 Gremlin?
500 DATA Stripe,Gizmo,Poddle,Cuddles,2
510 DATA What film was Dan Acykroyd in
 before Ghostbusters?
520 DATA Trading Places,Porkys,Gremlin
s,Stripes,4
```

JOE'S JOTTINGS

Listing 8. Green questions and answers

```
 410 REM GREEN Q/A's .....General Knowl
edge
 420 DATA 5 : REM No of questions
 430 DATA Who recently resigned as vice
 chairman of the Torys?
 440 DATA Geofrey Archer,Norman Tebbit,
Keith Joeseph,Norman Fowler,1
 450 DATA Who got lost in the Sahara De
sert?
 460 DATA Prince Andrew,Prince Edward,M
ark Thatcher,Geofrey Archer,3
 470 DATA How high is the dome of St. P
aul's cathedral?
 480 DATA 143 ft,256 ft,312 ft,365 ft,4
 490 DATA Who was the second man on the
 moon?
 500 DATA Neil Armstrong,Buzz Aldrin,Al
an Sheppard,Chuck Yaeger,2
 510 DATA Who is the Duke of York?
 520 DATA Prince Philip,Prince Edward,P
rince Charles,Prince Andrew,4
```

Listing 9. Cyan questions and answers

```
 410 REM CYAN Q/A's .....Pop
 420 DATA 5 : REM No of questions
 430 DATA Which record was number 1 the
 longest?
 440 DATA Mull of Kintyre,White Christm
as,Feed the World,Jingle Bells,2
 450 DATA What band was Trevor Horn lea
d singer with?
```

Continued ▶

◀ *AQUONI* listing 9 continued

```
 460 DATA Buggles,Queen,10CC,The four s
easons,1
 470 DATA Who danced on the ceiling?
 480 DATA Stevie Wonder,Lionel Ritchie,
Peter Cetera,Howard Jones,2
 490 DATA Who is Harry Webb better know
n as?
 500 DATA Boy George,Elton John,Cliff R
ichard,Paul Young,3
 510 DATA Who did Jimmy Sommerville sin
g with before the Communards?
 520 DATA Soft Cell,The WHO,The special
s,Bronski Beat,4
```

Listing 10. Purple questions and answers

```
 410 REM PURPLE Q/A's .....Computers
 420 DATA 5 : REM No of questions
 430 DATA Who is the Canadian chairman
of Acorn?
 440 DATA Brian Long,Hermann Hauser,Chr
is Curry,Bruce Smith,1
 450 DATA How many books has Bruce Smit
h written?
 460 DATA 5,14,18,22,3
 470 DATA Who recently left Acorn User?
 480 DATA Tony Quinn,David Atherton,Dav
id Acton,Colette Curley,3
 490 DATA What was Clive Sinclair's fir
st Computer?
 500 DATA ZX80,QL,Spectrum,MK14,4
 510 DATA How many computers have Acorn
 realeased?
 520 DATA 5,10,15,20,3
```

See Processed Programs, page 102

Listing 1, Printer driver: special characters only

```
 10 REM Printer driver:
Special characters only
 20 REM By David Spencer
 and Dave Atherton
 30 REM For BBC B/B+/M/C
/E with Epson compatible p
rinter
 40 REM (c) Acorn User
March 1987
 50 :
 60 wrchv=&20E
 70 nvwrch=&FFCB
 80 osword=&FFF1
 90 osbyte=&FFF4
 100 FOR pass=0 TO 3 STEP
 3
 110 P%=&900
 120 [OPT pass
 130 PHP
 140 SEI
 150 LDA #start MOD &100
 160 STA wrchv
 170 LDA #start DIV &100
 180 STA wrchv + 1
 190 PLP
 200 RTS
 210 :
 220 .start
 230 PHP
 240 PHA
 250 TXA
 260 PHA
 270 TYA
 280 PHA
 290 LDA #&DA
 300 LDX #0
 310 LDY #255
 320 JSR osbyte
 330 TXA
 340 BNE control
 350 TSX
 360 LDA &103,X
 370 BPL normal
 380 PHA
 390 STA pblk
 400 JSR bit
 410 LDA #&EC
 420 LDX #4
 430 LDY #&FB
 440 JSR osbyte
 450 PLA
 460 JSR nvwrch
 470 LDY #0
 480 LDA #&EC
 490 JSR osbyte
 500 .exit
 510 PLA
 520 TAY
 530 PLA
 540 TAX
 550 PLA
 560 PLP
 570 RTS
 580 :
 590 .control
 600 TSX
 610 LDA &103,X
 620 .normal
 630 JSR nvwrch
 640 JMP exit
 650 :
 660 .bit
 670 LDA #10
 680 LDX #pblk MOD 256
 690 LDY #pblk DIV 256
 700 JSR osword
 710 LDA #27
 720 JSR print
 730 LDA #ASC"L" \ Epson
double density
 740 JSR print
 750 LDA #12
 760 JSR print
 770 LDA #0
 780 JSR print
 790 JSR print
 800 JSR print
 810 \ Turn sideways for
printer
 820 LDY #7
 830 .loop
 840 LDX #0
 850 .loop1
 860 ASL pblk+1,X
 870 ROL A
 880 INX
 890 CPX #8
 900 BNE loop1
 910 JSR print
 920 DEY
 930 BPL loop
 940 LDA #0
 950 JSR print
 960 JSR print
 970 RTS
 980 :
 990 .print
 1000 \ Send to printer on
ly
```

Continued ▶

◀ Compact listing 1 continued

```
1010 PHA
1020 LDA #1
1030 JSR nvwrch
1040 PLA
1050 JMP nvwrch
1060 :
1070 .pblk
1080 \ For OSWORD call
1090 EQUD 0
1100 EQUD 0
1110 EQUD 0
1120 EQUD 0
1130 ]
1140 NEXT
1150 :
1160 total%=0
1170 FOR F%=&900 TO &9AA
1180 total%=total%+?F%
1190 NEXT
1200 IFtotal%<>16445 THEN
PRINT"Checksum error - Ch
eck Program." : END
1210 *SAVE EPSON1 900 99B
FFFF0900 FFFF0900
```

Listing 2. Printer driver: all characters

```
10 REM Printer driver:
All characters
20 REM By David Spencer
and Dave Atherton
30 REM For BBC B/B+/M/C
/E with Epson compatible p
rinter
40 REM (c) Acorn User
March 1987
50 :
60 wrchv=&20E
70 nvwrch=&FFCB
80 osword=&FFF1
90 osbyte=&FFF4
100 FOR pass=0 TO 3 STEP
3
110 P%=&900
120 [OPT pass
130 PHP
140 SEI
150 LDA #start MOD &100
160 STA wrchv
170 LDA #start DIV &100
180 STA wrchv + 1
```

Continued ▶

◀ Compact listing 2 continued

```
190 PLP
200 RTS
210 :
220 .start
230 PHP
240 PHA
250 TXA
260 PHA
270 TYA
280 PHA
290 LDA #&DA
300 LDX #0
310 LDY #255
320 JSR osbyte
330 TXA
340 BNE control
350 TSX
360 LDA &103,X
370 CMP #32
380 BCC normal
390 CMP #&7F
400 BEQ normal
410 PHA
420 STA pblk
430 JSR bit
440 LDA #&EC
450 LDX #4
460 LDY #&FB
470 JSR osbyte
480 PLA
490 JSR nvwrch
500 LDY #0
510 LDA #&EC
520 JSR osbyte
530 .exit
540 PLA
550 TAY
560 PLA
570 TAX
580 PLA
590 PLP
600 RTS
610 :
620 .control
630 TSX
640 LDA &103,X
650 .normal
660 JSR nvwrch
670 JMP exit
680 :
690 .bit
700 LDA #10
710 LDX #pblk MOD 256
720 LDY #pblk DIV 256
730 JSR osword
740 LDA #27
750 JSR print
760 LDA #ASC"L" \ Epson
double density
770 JSR print
780 LDA #8
790 JSR print
800 LDA #0
810 JSR print
820 \ Turn sideways for
printer
830 LDY #7
840 .loop
850 LDX #0
860 .loop1
870 ASL pblk+1,X
880 ROL A
890 INX
900 CPX #8
910 BNE loop1
920 JSR print
930 DEY
940 BPL loop
950 RTS
960 :
970 .print
980 \ Send to printer on
ly
990 PHA
1000 LDA #1
1010 JSR nvwrch
1020 PLA
1030 JMP nvwrch
1040 :
1050 .pblk
1060 \ For OSWORD call
1070 EQUD 0
1080 EQUD 0
1090 EQUD 0
1100 EQUD 0
1110 ]
1120 NEXT
1130 :
1140 total%=0
1150 FOR F%=&900 TO &9A2
1160 total%=total%+?F%
1170 NEXT
1180 IFtotal%<>16453 THEN
PRINT"Checksum error - Ch
eck Program." : END
1190 *SAVE EPSON2 900 99B
FFFF0900 FFFF0900
```

Listing 3. *View* EXEC file converter

```
10 REM View to EXEC file converter
20 REM By David Spencer
30 REM For BBC B/B+/M/C/E
40 REM (c) Acorn User  March 1987
50 :
60 DIM fblk 17
70 INPUT "Enter name of VIEW file : "
file$
80 DIM name LEN file$
90 $name = file$
100 ?fblk = name MOD &100
110 ?(fblk+1) = name DIV &100
120 !(fblk+6) = -1 : REM Execution add
ress = &FFFFFFFF
130 X%=fblk MOD &100
140 Y%=fblk DIV &100
150 A%=3 : REM To write exec address o
nly
160 CALL &FFDD
```

Listing 4. Code keys

```
10 REM Code keys
20 REM By Dave Atherton
30 REM For Compact only
40 REM (c) Acorn User  March 1987
50 :
60 MODE 6
70 PRINT "Press CTRL/SHIFT/CODE then.
.."
80 FOR I=128 TO 255
90 PRINT "Char:";CHR$ I;TAB(10)"Key:"
;
100 IF I<160 THEN PRINT"CTRL-";CHR$(I-
64)
110 IF I=160 THEN PRINT"SPACE"
120 IF I=255 THEN PRINT"DELETE":GOTO 1
40
130 IF I>160 THEN PRINT CHR$(I-128)
140 NEXT
```

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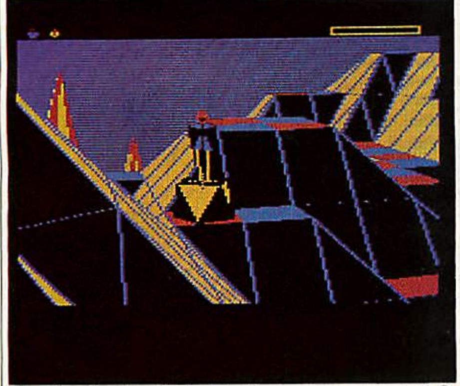
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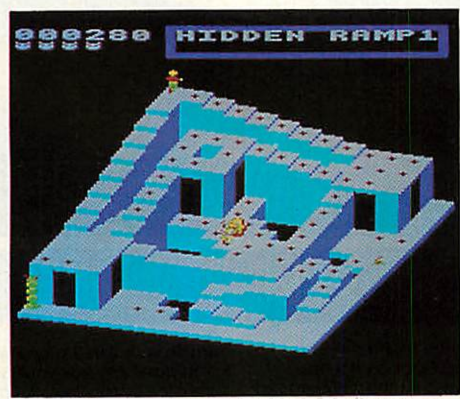


Check out the latest position of your favourite game

TOP 20 BBC MICRO GAMES

	Title	Publisher	Cassette	Disc	B+	Master	Compact	Reviewed
1	(2) Repton 3	Superior	£9.95	£11.95	Yes	Yes	£14.95	January '87
2	(1) Stryker's Run	Superior	£9.95	£11.95	Yes	Yes	£14.95	January '87
3	(10) Ravenskull	Superior	£9.95	£11.95	Yes	Yes	—	March '87
4	(4) Commonwealth Games	Tynesoft	£6.95	£8.95	Yes	Yes	£9.95	—
5	(3) Trivial Pursuit	Domark	£14.95	£19.95	Yes	Yes	—	January '87
6	(12) Winter Olympics	Tynesoft	£6.95	£8.95	Yes	Yes	£9.95	September '86
7	(13) Computer Hits 10 Volume 3	Beau Jolly	£9.95	—	Yes	No	—	March '87
8	(7) Micropower Magic	Micropower	£7.95	£7.95	Yes	Yes	—	—
9	(–) The Sentinel	Firebird	£9.95	£14.95	Yes	Yes	—	January '87
10	(9) Jet Set Willy	Software Projects	£9.95	£11.95	Yes	Yes	—	—
11	(14) Crystal Castles	US Gold	£9.99	£14.99	*	*	—	—
12	(11) Phantom Combat	Doctorsoft	£9.95	£11.95	Yes	Yes	—	February'86
13	(–) Five Star Games	Beau Jolly	£9.95	—	*	*	—	—
14	(17) Karate Combat	Superior	£8.95	£11.95	Yes	Yes	£14.95	July '86
15	(6) Psychastria	ASL	£7.95	£11.95	Yes	Yes	—	February '87
16	(5) Kane	Mastertronic	£1.99	—	No	No	—	—
17	(8) Thrust	Superior	£7.95	£11.95	Yes	Yes	—	February '87
18	(–) Colossus 4 Chess	CDS	£9.95	£12.95	*	*	—	—
19	(–) Trivial Pursuit Young Players	Domark	£19.95	£14.95	Yes	Yes	—	—
20	(–) Dodgy Geezers	Melbourne House	£8.95	—	*	*	—	—


The Sentinel puts in his first appearance at 9



Crystal Castles: new arrival in both charts



Winter Olympics: seasonal success at BBC 6

TOP 10 ELECTRON GAMES

	Title	Publisher	Cassette	Disc	Reviewed
1	(1) Computer Hits 10 Volume 3	Beau Jolly	£9.95	—	March '87
2	(2) Repton 3	Superior	£9.95	—	January '87
3	(6) Ravenskull	Superior	£9.95	—	March '87
4	(3) Micropower Magic	Micropower	£7.95	—	—
5	(7) Crystal Castles	US Gold	£9.99	—	—
6	(8) Five Star Games	Beau Jolly	£9.95	—	—
7	(4) Mousetrap	Tynesoft	£6.95	—	—
8	(–) Power Pack	ASL	£9.95	—	—
9	(10) Thai Boxing	Anco	£5.95	—	—
10	(9) Strike Force Harrier	Mirrorsoft	£9.95	£12.95	January '86

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The 5¼" disc version of Elite now includes:
- The standard Model B, B+ game
- The 6502 Second Processor version
- The Master 128 or Turbo version

ELITE

Front View

BBC Micro Models B, B+

Front View

BBC Master Series

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Are you ready to accept the challenge?

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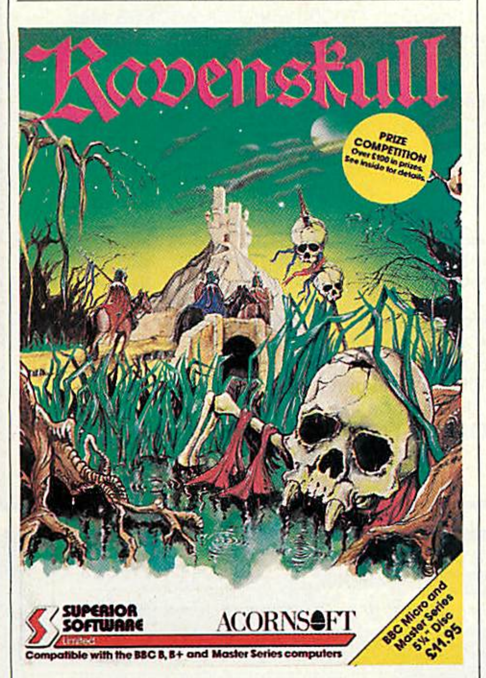
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REVIEWS

GAMES

ADVENTURERS IN THE ARCADES



Ravenskull; Superior Software; BBC B/B+/Master and Electron; £9.95 cassette, £11.95 disc

Ravenskull is Superior's latest offering and on the BBC micro features all the hallmarks of an excellent Superior game.

Ravenskull Castle is a mysterious place that contains hoards of unclaimed treasure and four sections of a mystical silver crucifix, one of which can be found on each of the four levels of the game. The first, called 'Ravenskull Castle', is comparatively easy. The second is 'The Catacombs', followed by 'The Bee's Hive' and finally 'The Time Shaft'. Each of these levels is 64 times bigger than the displayed screen and is similar to *Repton*. The scrolling is excellent, and flicker-free.

You explore the castle in one of four guises, and the character you choose determines the treasure you have to collect. Adventurers collect chests, Wizards hunt for crystal balls, Warriors amass shields and Elves bags of gold. All the treasure on each level must be rounded up before you can get the piece of crucifix.

Various useful items such as spades, axes, dynamite and keys have been thoughtfully left around the castle. You must work out how and where to use these to their maximum advantage. A careless wizard has also left a number of potions to be drunk and scrolls to be read. These cause weird effects such as speeding the game up, slowing it down, teleporting or even killing you, and one of them reverses the control keys! (This also happens if you drink the wine.)

You must also avoid acid pools, man-eating plants and the deadly guardians of the castle, the Ravenbees! Other nasties include moving walls, slamming doors and spike traps.

A status screen is included which enables you to examine objects, see what you are carrying, and check your score.

Ravenskull is a very good game and is destined to be another Superior classic, especially with the £100 prize.

David Lawrence

Bernard Emblem adds: *Ravenskull* is another distinctly superior offering for the Electron which is not unlike the *Reptons* at first glance. However, it is significantly different to play, as I realised when my wife, our *Repton* fanatic, described *Ravenskull* as 'the worst I've ever played'.

Why? Well, she hates adventures, and *Ravenskull* is really a classic adventure with arcade graphics, but involving lots and lots of trial and error, and endless journeys back and forth, as you try for the hundredth time to work out why the pickaxe will bash a hole in some walls, but not others. It's a game I love, but it will appeal mainly to adventure fans.

JOLLY GOOD COMPILATION

Computer Hits 3; Beau Jolly; Electron cassette £9.95, BBC B/B+ cassette £9.95

This is probably Beau Jolly's best attempt to put 10 Electron hits in one pack. Its two previous Electron compilation tapes were mixed bags, but this selection contains only one game I wouldn't play twice. The tape contains a well balanced mixture of arcade, strategy, adventure and simulations.

Centibug: An average version of the centipede theme. You sit at the bottom of the screen shooting an approaching insect, which splits into nasty bits when hit.

Brian Jacks' Superstar Challenge: An above average sports simulation in which you challenge Mr Jacks over eight events. Unlike some sports games, this one requires more strategy than key bashing.

Vision's *Snooker*: One of the better versions of a popular simulation. I didn't get the hang of it the first time around, but I'm not so hot on the snooker table either. I liked it because it's one of the few successful two-player Electron games.

Felix in the Factory: Though four years old, this ladders 'n' platforms game has always been one of my family's favourites.

Danger UXB: Another game I've always loved. It's a truly addictive game with excellent sound, graphics and feel.

Alien Dropout: Dated space invaders.

Felix Meets the Evil Weevils: A disappointing follow-up to the factory classic.



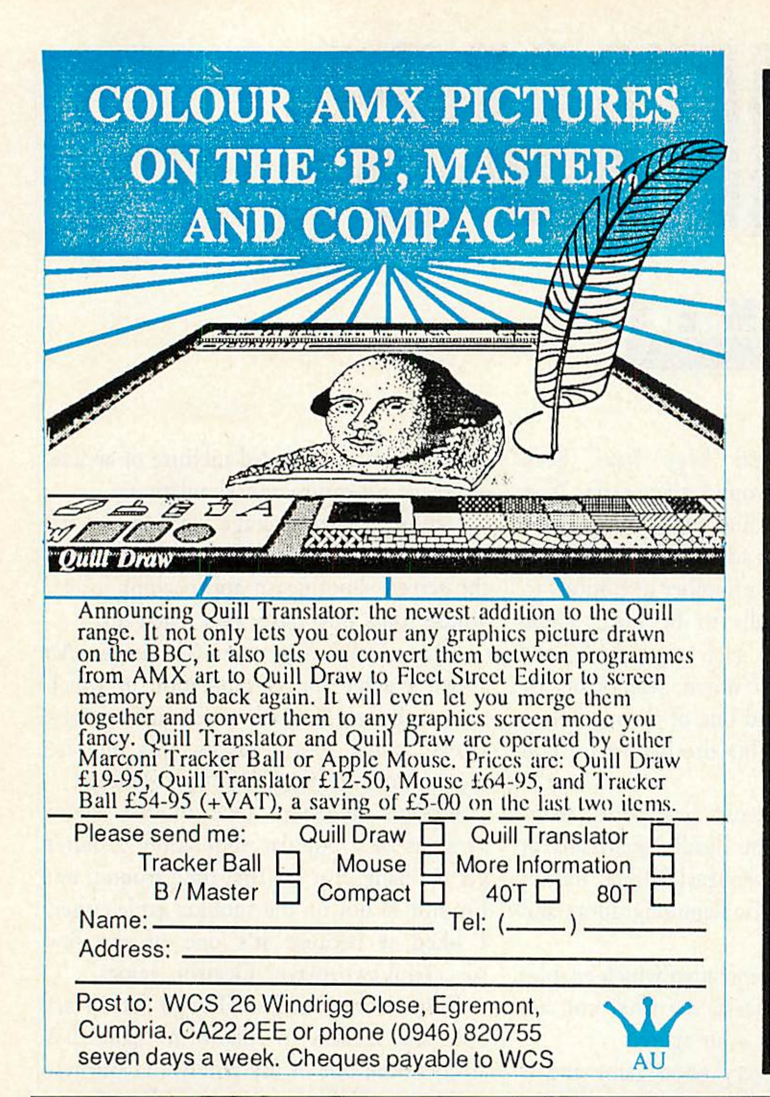
Jungle Boy: Run along the path, jump the rivers, get to Jane. Family fun.

Mineshaft: Collect lumps of coal which are dotted all over each of the 20 screens. A forgotten hit well worth digging up.

Stranded: An adventure featuring full colour graphics which take forever to appear and a disappointing plot.

As with all Beau Jolly's compilations, *Computer Hits 3* represents excellent value for money, even taking into consideration that some of the better games are currently available for £2 or less.

Bernard Emblem



Announcing Quill Translator: the newest addition to the Quill range. It not only lets you colour any graphics picture drawn on the BBC, it also lets you convert them between programmes from AMX art to Quill Draw to Fleet Street Editor to screen memory and back again. It will even let you merge them together and convert them to any graphics screen mode you fancy. Quill Translator and Quill Draw are operated by either Marconi Tracker Ball or Apple Mouse. Prices are: Quill Draw £19-95, Quill Translator £12-50, Mouse £64-95, and Tracker Ball £54-95 (+VAT), a saving of £5-00 on the last two items.

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DOUBLE PHANTOM has all the usual PHANTOM features including the fastest and smoothest 3D colour graphics around (15fps). RAF Phantom pilot Paul Courtnage's verdict: "Marvellous . . . quite the best micro flight simulation I've ever seen . . . Totally captivating!"

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A comparison of three 65C12 assemblers

Feature	ADE +	BBC Basic	MACROM
Number of pseudo-ops	64	4	36
Use of all available RAM	Yes	No	No
Macros	Yes	No	Yes
String functions	Yes	Yes	No
True macro libraries	Yes	No	No
Relocatable output	Yes	No	No
Linker with libraries	Yes	No	No
High level constructs	Yes	Yes	No
Use any editor?	Yes	No	No
Number of error reports	39+warnings	3+BASIC errs	20
65C00 extended opcodes	All	65C12 only	65C12 only
Switch off 65C12 opcodes	Yes	No	No
ROM size	32K	16K	16K
Disassembler	Symbolic	No	Simple
Label restrictions	No	Yes	Yes



Versions and prices

Recommended for Master Compact...
ADE+ MMU and 65C00 series assembler on disc (3.5" ADFS). 32K sideways RAM required.
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ADE+ is a 65C00 series assembler system supporting all the mnemonics of the 65C12 used in the latest BBC microcomputers plus the additional 'Rockwell' instructions. ADE+ is fast, faster in fact than the in-built BASIC assembler and all rival products that we have tested. The assembler produces absolute code that can be *RUN or linker modules that can be merged with the output from other programs using the ADE+ linker. ADE+ supports a powerful linker which drastically cuts assembly time; a feature normally only found on minis and mainframes. The linker will even link the output from compilers with your assembly language programs. Full library support for both the linker and the assembler is provided – fast searching for unknown instructions in a random access macro library. ADE+ is a modular system with many modules to add later; i.e. a mouse based editor & a Z80 cross assembler! A print spooling system uses sideways RAM as a print buffer to eliminate waiting time; your listing runs off as a background job! Use the print spooler from BASIC or your own programs. ADE+ uses ALL available memory. With a second processor attached the 10 processor spare memory is used as a buffer to reduce the amount of disc access. All available memory is handled by ADE+'s intelligent memory management module. Use your own favourite editor or the one provided. Assemble from disc or memory. Full utilities including librarians, converter for BBC BASIC etc. ADE+ must be the bargain of 1986/87!

GAMES

THE GAMES PAGE

David Lawrence casts an eye over some new releases, some old games re-released and some maps to help lost adventurers

Superior's take-over of Acornsoft has led to many of the old BBC micro favourites being re-released. *Elite* and *Revs* have been repackaged, their prices slashed, and new features added.

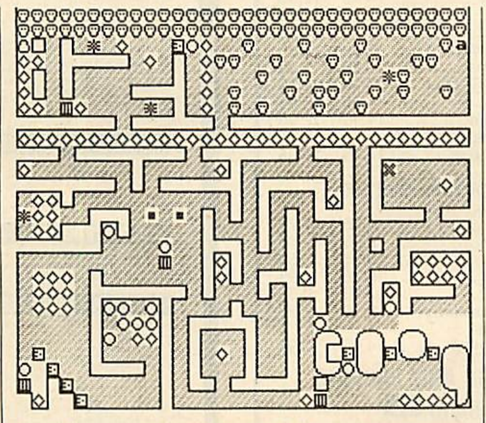
Revs now comes with computer assisted steering (CAS), essentially a helping hand round the corners – if you under or over-steer, the computer will compensate. However, you still have to get your speed and position right. (If you send in lap times for the high score table, be honest and don't use CAS.)

Revs 4 Tracks has been packaged with *Revs* for £14.95, less than half the original Acornsoft price. A version for the Compact is also available, but trying it on our office machine, nothing happened... The problem was tracked down to the Econet board putting PAGE up to &1000 (instead of &E00) – so Econet users * UNPLUG your ANFS chip before revving up.

Elite is available for the Electron and BBC B on tape, for the Compact on 3.5in disc and for the BBC B, B+, Master 128 and 6502 second processor on *one* disc. The latter checks to see what system you are using and runs the appropriate version. The Master 128 and Compact versions are similar to the 6502 version – mode 1 main display, mode 2 scanner, no disc access during the game and overall, much faster. The Master version also works with the turbo co-processor. I wonder what happens if you have a second processor plugged onto a Master as well?

Apart from these two, eight of the original Acornsoft games have been re-released on two discs at £12.95 each. *Acornsoft Hits 1* contains *Magic Mushrooms, Maze, Planetoid* and *Rocket Raid* and *Hits 2* has *Starship Command, Arcadians, Labyrinth* and *Meteors.* (Wot? no *Snapper*?) Both discs represent very good value for money if you have not already got the games.

The first of Incentive's Medallion Series of adventures is now out. *Winter Wonderland* places you in a desolate ice field next to a crashed plane and you must get back to civilisation. The adventure was created



Assistance at last! One of Rob Miller's maps – screen 0 of *Repton 2*

using *Incentive's Graphic Adventure Creator (GAC)* and so it is possible to load the adventure back into the creator. The occasional graphically depicted locations are very nice, and certainly give the game more interest than it would otherwise have.

Since last month's page, I have received *Impossible Mission* from US Gold and overall I am very impressed. The graphics are excellent and the game is sufficiently complex to not lose your interest after a couple of plays. I have managed to complete about three-quarters of it, but because the layout is different every time, I don't know whether I could do it again! Let's hope we see some more companies producing games of this quality.

Ultimate has released a second compilation of its games, called *Unbelievable! Ultimate*, which contains *Jetpac, Knight Lore, Sabre Wulf* and *Nightshade.* Nothing new, but all are high quality arcade adventures with excellent graphics. If you haven't got these, then this tape could be well worth buying.

After the *Thunderstrucks, The Last of the Free* and *Psycastria*, Audiogenic has put together (yet) another compilation of some of its older games. *Power Pack* contains 'seven great games for your BBC' (or Electron). For 'seven great games', read three good games and four hmmmmmm... games. However, one of my personal favourites, *Contraption*, is there.

I am not all that interested in chess, but CDS's *Colossus 4 Chess* is something else! I mentioned last month that this is the sequel to Martin Bryant's hugely successful *White Knight 11* and *12.* Anyway, booting the disc on my Master, I was presented with a 3D screen and almost instant moves by the computer – very nice! Full review coming soon.

On the adventure scene, *Dodgy Geezers* from Melbourne House is the 'sequel' to *Hampstead* and *Terrormolinos,* and is another very funny real life adventure from Trevor Lever and Peter Jones. It includes the diabolical *Dodgy Geezers* soundtrack – does anybody remember *Pimania?*

Talking of adventures, can anybody help David Watkins with *Price of Magik?* He wants to know how to kill the wraith and how to get the sword hilt. Jack Wasey, however, is still battling it out with *Twin Kingdom Valley* and would like to know what to give the guard of the forest king and where he can find the silver key.

Judging by the amount of mail we get on the subject of *Castle Quest,* many of you are still playing the adventure, and if you would like the complete solution, including map, please send a large (12 inch by 9 inch) stamped addressed envelope and a cheque for £1 to the Games Page at the usual *Acorn User* address. Please mark your envelope 'Castle Quest'.

The *Repton 2* maps are now finished! See the sample on this page. As the competition is now finished, Superior Software has divulged some of this fiendish game's secrets in the form of comments on some of the maps. If you would like the complete set of 18 maps, please send an sae as above with a cheque for £1 and mark your envelope 'Repton 2 maps'.

Rob Miller, the artist behind these maps, is currently working on *Ravenskull* and these should be available very soon. If you have drawn any maps for games, send them in. I'd be interested to see them, and so, no doubt, would other readers.

That's all for now, but things to watch out for are a game Frank Bruno would approve of, an escapade in Ancient Greece and something to do with boots ...?

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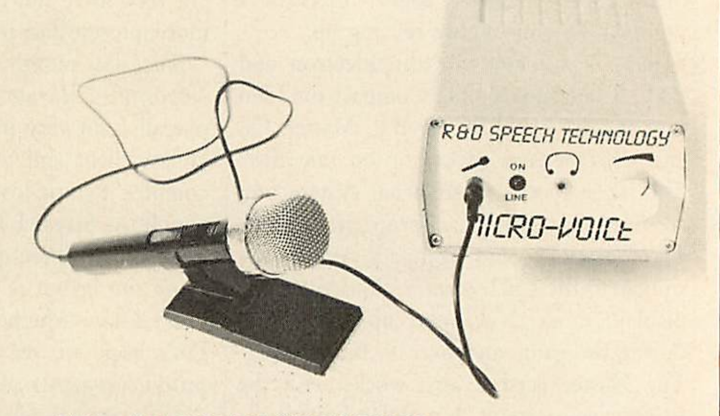
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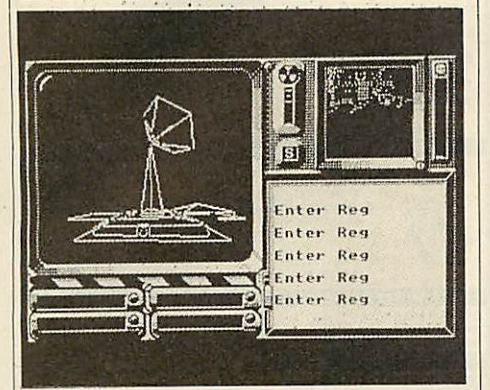
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REVIEWS

GAMES

SUCCESSFUL RECIPE



Cholo; Firebird; BBC B/B+/Master cassette £12.95, disc £17.95

Take a large amount of *Elite,* mix well with the strategy of *Castle Quest,* the reflex actions of *Zalaga* and the puzzles of *Snowball.* Stir well and add some very fast graphics to taste.

What to do you get? Easy, the new Firebird release *Cholo.* This is not some kind of space-age mint, but a post-nuclear attempt to save humankind from the domination of robots.

Before the war, man hid in nuclear bunkers and programmed robots to patrol the surface of the earth until it was safe to come back up. However, the robots have had ideas of their own and want the planet to themselves, hence even though the fall-out has gone they won't tell the humans.

Initially, you control a rebel 'Ratdroid' with which you must capture other robots and work out how to penetrate the fortress the robots have built over the humans' bunker. Any robot can be captured if you have the correct password. Once captured, you can then control that robot as well as the Ratdroid. You can select the robot you control from a menu that shows a picture of the robot rotating *Elite*-style.

Different robots have different abilities: some can fire, some can fly, some can fix other robots and some can 'hack' and find passwords. There are also 'passive' robots such as video cameras and Coke machines.

The view from your robot is displayed with 3D wire frame graphics and, thanks to the very high update rate, gives an excellent sense of movement. The city you explore is made up from 2000 structures including buildings, trees and pyramids.

The only niggles in the game are when a very large building suddenly disappears because the drawing routine doesn't think it's worth drawing! Also you, can see through solid objects (like *Elite*'s planets), but the extra processing needed to correct this would slow the game down too much.

One of the most impressive features is when you 'park' a robot in front of another, select the second robot from the menu and then turn round – you'll be able to see the first robot sitting there!

I won't give too much away, but you must work out how to cross the bridge, fly the plane, explore the science complex, avoid high radiation and get to Logic Island whilst on your way to rescuing the human race.

Overall, the game is very well put together, the graphics are excellent and the idea original. It should appeal to everyone who likes both arcade games and adventures – well done Firebird.

David Lawrence

A BIT OF A DRAG

US Drag Racing; Tynesoft; Electron/BBC micro cassette £7.95, BBC B/B+/Master 5.25in disc £12.95, Compact 3.5in disc £12.95

When I received *US Drag Racing,* the first thing I noticed was the poor packaging. Disc users are given a 40/80 track disc with no sleeve, in a flimsy card wallet, with a cassette inlay for instructions!

The object of the game, as you may have guessed, is to beat the computer controlled car. This may appear easy, but pressing '<' and '>' alternately to go faster than the computer can be very awkward – especially as you have to hold the space bar down to change gear.

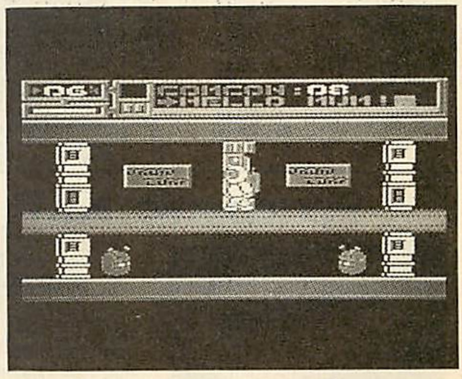
The computer has five cars and drivers' names that come up to *Revs* standard. When you beat the current car you go on to the next more powerful car, these are described very imaginatively on the inlay.

As mentioned, to make your car go faster you have to bash your keyboard harder (or was it faster?). This is not really an idea I fully agree with, but, as yet, no one has come up with a better solution. When you do get going, a quarter of a mile is a long way (it seems like about 10,000 key presses!). A nice touch at the end is the automatic ejection of your parachute.

Overall, I give *US Drag Racing* the thumbs down. Even though the graphics are fairly impressive, a 3D scrolling screen would be much better than a stationary car and flashing bars to show movement down the track. As far as the sound goes, there is plenty of room for improvement, and that goes for everything else about this program. Come on Tynesoft, pull your finger out and keep those standards up!

Richard Bellis

STRIKE TWO



Thunderstruck 2; ASL; Electron/BBC cassette £7.95, disc £11.95

Just when you complete *Thunderstruck,* and think you are safely home at last, you find the theme continues in *Thunderstruck 2,* the latest offering from the highly successful ASL/Peter Scott partnership, which brought you the arcade adventures *Last of the Free* and *Thunderstruck* itself.

Like its predecessor, the theme is a compelling mixture of strategy and logic, with many problems requiring the player not only to collect objects in a certain order, but also to perform some dextrous finger tapping to position himself in the right place at the right time to use them.

A brief list of some of these objects may give a clue to the complexity and originality of *Thunderstruck 2*'s plot. They include a passcard, keys, blunt block, weight, hammer, drill, pattern, fire extinguisher, spade, program disc, video, peace sign, ID card and food.

Having played both Electron and BBC micro versions I can report that, as is usually the case with ASL's offerings, there is little to choose between the two.

Bernard Emblem

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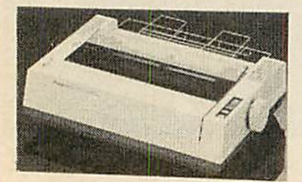
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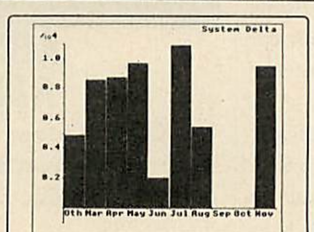
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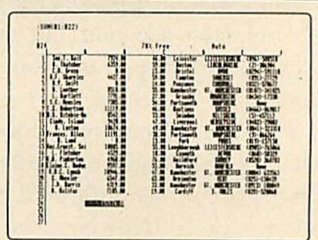
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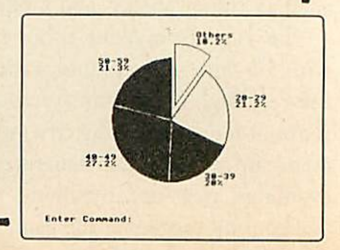
Ours couldn't either so we linked it to ViewPlot, ViewSheet, View, Interchart, Intersheet, Interword and Wordwise+.

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SOFTWARE

HOME OFFICE

Roger Carus tests *Mini Office II* and finds it good value for home applications

There is a great deal to admire about the *Mini Office II* suite of office-type programs from Database Software – provided you are aware of its limitations from the start.

The programs do all that is promised but they are not designed to be, nor are they suitable as, business programs: what they are is a good collection of serviceable programs for the BBC micro user who usually writes programs or plays games and needs the facility to perform one or more of the functions which this software offers. If you prefer not to fill your micro with expensive ROMs which are rarely used, then it may well be for you.

The suite consists of a wordprocessor, database, spreadsheet, graphics package, label printer and a communications program which is little short of miraculous at the price, and each is good in its own way. They can even be used in conjunction with an AMX Mouse.

Mini Office II is a big improvement on the previous version and there is a helpful program to convert files from that edition (which I did not test) so there is continuity – which makes a pleasant change!

In the end I tried the cassette and both disc formats, but I must say the length of time it takes to load from a cassette would put me off, and it was beyond me to copy any of the versions I used. I have every sympathy with copyright protection, but it is a nuisance when you have to send for a replacement disc to access your own files every time you corrupt the master copy. The publishers were very helpful at all times.

The various components are impressive and the wordprocessor has features not found in many of the expensive packages. At first sight it looks like *Wordwise* + on the screen, with characters free and a time counter showing the seconds spent in writing. Editing is in 40 columns and there are



The database is just one of six programs

excellent pull-down menus for formatting, printing, previewing and so on. There is only one problem: the capacity of a document is only 5890 characters, so you can only hope for about 1000 words, hence it is really only suitable for letters.

The spreadsheet is perfectly satisfactory for almost any domestic use, and has space for 3901 characters. I thought some of the instructions a little clumsy, but the use of the function keys was good. I missed the ability to complete two-dimensional calculations with a single instruction (eg, fill a multiplication table) but otherwise there was no problem in operation, and you can even save data for the graphics display.

The graphics program is also good, so far as it goes, which is to produce bar, line and pie charts and, as it is self-scaling with a good choice of shading, the effect is impressive. It suffers slightly from the usual problems of inserting satisfactory titles, but that barely matters.

To my surprise it also offers a communications package designed to work with the MicroLink/Telecom Gold network with a variety of protocols and also to access standard bulletin boards. I did not test these facilities but I have seen the comms package demonstrated very effectively.

There is also a convenient label-printing program which integrates with the database to produce labels in a variety of formats with a minumum of knowledge or effort, and then print them on any printer.

It was on the database itself that I encountered serious problems because nothing would persuade the program to come up on my screen. This was probably because of confusion of commands with a (Mertec) database ROM on my board, combined with a Watford DFS, version 1.30. When I tried the disc on another micro there seemed to be no problem.

The whole package comes in a convenient box with a well written 64 page manual, 14cm square.

There is an enormous amount of good and thoughtful programming in this package and, if you are able to accept the inevitable limitations which it imposes, you will get excellent value.

Very recently, and since the main part of this review was written, a new version of *Mini Office II* has been produced by Database, in the form of four chips mounted on a ROM board with an extension which occupies a single socket. This version, priced at £59.95, runs on all models including the Master and Compact.

The ROM version is obviously less simple to install than a disc, but it overcomes all of the problems referred to above. Since it also works with Watford or Aries sideways RAM, it has much greater capacity for longer documents in the wordprocessor and more data in the database.

Mini Office II, Database Software, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. BBC B, B+ and second processor; available in cassette, £14.95; 40 track and 80 track discs, £16.95; and 3in discs, £19.95. Also a ROM board for BBC B, B+, the Master and Master Compact, and Econet. This costs £59.95.

Existing Mini Office II owners can obtain an £8 discount when upgrading to the ROM version.

SOFTWARE

CRAFTY WORK

Picture Craft's educational graphics left Jonathan Baldwin impressed

With a market seemingly awash with computer aided draughting programs of all types, for any new package to succeed it needs to be carefully tailored to suit its potential customers.

Picture Craft is presented with a great deal of care and attention to detail, and is aimed at children aged between six and 14. After a month or so of using it I am convinced that the author, Peter Smith, has put at least as much effort into researching the needs of parents, teachers and children as he has into software development.

Picture Craft is supplied as a suite of programmes on disc, accompanied by a set of instruction cards, a paperback book, ideas for games and constructions, and some sheets of paper covered with triangles and hexagons. The program offer very clear screen prompts but to make the most of it you should use it in conjunction with the book, for the first few sessions at any rate. The first section of the book is an instruction manual which assumes no detailed experience with computers except for a passage about the copying of discs. However, this is no great problem as most of it only affects users of 80 track drives.

On booting the disc with Shift-Break, you are presented with the main menu, which is initially a rather spartan affair, but more of this later. The options offered are the design and display of pictures or the framed drawing area bounded on its right by four screen prompts and a vertical 'thermometer' which displays the remaining free memory. Pictures are drawn by selecting one of a predefined set of seven shapes, moving it with the cursor keys and 'fixing' it with Return. Two of the function keys have been set up to expand or reduce the shape and a third will initiate a rubber-band line drawing routine. As the drawing progresses the memory indicator creeps inexorably upwards and it is noticable that the shapes use far less memory than lines.

With the drawing stage complete it is time for a spot of colour, and the Escape key is used to leave the drawing screen. Should this key be brushed accidentally the computer gives an insistent series of warning beeps and pressing any other key restores the status quo; hitting Escape a second time will make the change. This done, the program presents another menu so that you can choose between painting, saving or starting the picture again. The painting screen is very similar to the drawing screen except that this time the right hand side shows a set of coloured blocks alongside the memory indicator. A couple of arrows show which colour will be used for painting, and pressing Space advances these down the blocks.

The clear, straightforward response of this type of indicator was very popular with the class of 13-year-olds with whom I used the program. Return begins the colour filling of the shape which contains the cursor. The book describes the fill as being fast and I would be the first to agree; it fairly eats up the screen!

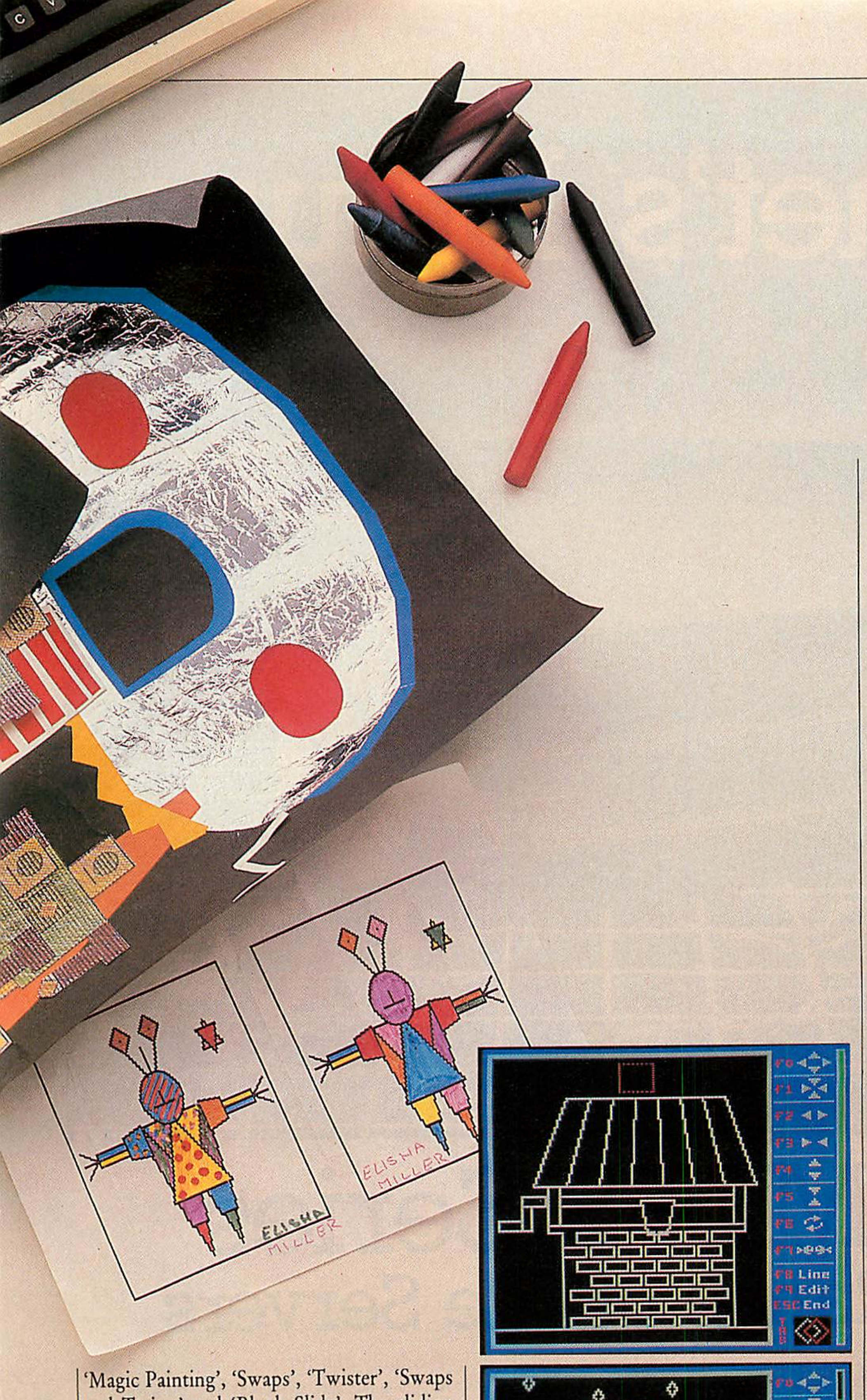
Of course the trouble with fills is that any small gap in a shape will allow the colour to 'leak' out with disastrous consequences, so *Picture Craft* allows you to 'clear' the offending colour if necessary. Another nice touch is that it is possible to go over filled shapes with new colours, even when using patterned effects.

As with the drawing stage of the program, the painting option is brought to an end by hitting Escape twice. You then have the choice of saving the painting or discarding it to go straight back to the menu.

Once a picture has been saved it can either be displayed and dumped to a printer, or, if you care to, it can be made the subject of one of the games. There are five of these and they are listed in the manual as

Pictures from 13-year-olds at Wakeford School, Havant: faces by Janine Fretwell and Julie Ward, Trons by Steven Sanders and Lee Robertson plus Elisha Miller's androids

MAIN PHOTOGRAPH BY JAMES JOHNSON



'Magic Painting', 'Swaps', 'Twister', 'Swaps and Twists' and 'Block Slide'. The sliding block puzzle is the familiar teaser with the added attraction of seeing your own compositions moving gracefully around the screen in little chunks. The children were most impressed by this, as they were by the 'Magic Painting' game.

This is one of those ideas that seems so blindingly obvious that you cannot help but wonder why no one has thought of it before. 'Magic Painting' selects images from the picture disc and draws them in black outlines on a black background. The players in the game then position the cursor somewhere on the screen and press a key to start colour-filling. With luck the resulting shape might offer some clue as to what the picture is supposed to represent but in the normal course of events it is very misleading. The fact that the choice of colour is usually quite inappropriate is no help and adds to the general enjoyment of playing the game.

The 'Magic Painting' option really needs to be played with children who are new to the pictures used. The pupils tried out their pictures on friends who clearly enjoyed the game; I think that the artists enjoyed watching their struggles at least as much.

The other games can be played by one child alone since, like the block puzzle, they are based on various ways of sorting out a scrambled up picture.

I think that the games are one of the selling points of *Picture Craft*, not only as entertainment but also for their educational value. Through playing them the pupils learnt to recognise and replace shapes; 'Twister' also promoted an understanding of two or four-fold rotational symmetry.

Once familiar with drawing and painting you can select other options from a 'hidden' command in the main menu. Through this, the shape-sets can be redesigned, the drive numbers for disc storage can be changed, other choices for painting and drawing can be included and so forth.

About half the book is taken up with ideas for using *Picture Craft*; it describes more games, suggests related activities which do not need the computer and finishes with a book list for sources of future inspiration.

The package allows for five copies of the program disc to be made and at a retail price of about £20 it should prove attractive to schools. I should imagine parents would prefer to pay less and be allowed fewer copies, but otherwise *Picture Craft* certainly maintains the exceptionally high standard of software which BBC Enterprises is now producing.

Picture Craft, disc for BBC B/B+/Master and Econet, £19.95 including VAT from BBC Enterprises.

***Picture Craft* in action. These are 'drawing' screens. They can be coloured on screen using the 'painting' option, or alternatively printed out and hand coloured and used in collages, as in the main illustration**

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SOFTWARE

A CLEVER KIT OF TOOLS

Rob Fenton opens up Chalice's new toolkit ROM and finds a host of handy commands

The past few months have seen a glut of software 'toolkit' ROMs for the BBC micro, the majority of which have been 16k enhancements of their 8k predecessors.

Although different in name, *Mega-Rom*'s command set bears a strong resemblance to that of Chalice's earlier release *The Scythe*. Supporting no less than 67 commands (some 20 or so more than most popular 16k toolkits), *Mega-Rom* must be about the best value; the most comprehensive utility ROM chip of its kind. There is something for everyone.

One quite major omission, however, is that of a scrolling Basic editor. To get round this, one might purchase in addition to *Mega-Rom*, Acornsoft's excellent stand-alone editor; together these two ROMs will serve you far better than, say, one 16k toolkit which offers both. It rapidly becomes clear that the space saved by dropping the editor from its command set is more than compensated for by the rest of *Mega-Rom*'s large array of utilities.

I was pleased to find few space fillers in the four clear help lists (a fact which Chalice appears to be pushing in its advertisements for the ROM). Indeed, *Mega-Rom* introduces some novel features not to be found in other toolkit ROM chips. For instance, there is a command to change the load and execution addresses of any named file without the need to load and resave the whole file.

As the help lists reveal, the commands are split into four distinct uses: ROMs, operating system (OS), filing and Basic. Unfortunately, I found a number of the filing commands worked incorrectly when used with the Solidisk DDFS's double density mode; it's a shame the author could not have catered for users of double density. However, when working in single density, even on the 1770, the commands functioned properly – including the formatter (which, in my experience, is more than can be said for many other toolkits).

The ROM commands offered are both thorough and, more importantly, effective. The facilities to enable and disable ROMs are as good as any others you're likely to

```
>VDU14
>*H.FILE

MEGA ROM 1.00
 CLOSE
 SCRAMBLE <filename> <password> <<filena
me>>
 UNSCRAMBLE <filename> <password> <<file
name>>
 FREE <<drive>>
 FORMAT <tracks> <<drive>> <<track>>
 VERIFY <tracks> <<drive>> <<track>>
 SECTLOAD <address> <track> <sector> <<s
ectors>> <<drive>>
 SECTSAVE <address> <track> <sector> <<s
ectors>> <<drive>>
 FSFIND <string> <start track> <end trac
k>
 FBFIND <start track> <end track> <byte>

 EDSECT <track> <sector> <<drive>>
 REPAIR <track> <<drive>>
 MRELOC <filename>
 ALTER <filename> <load> <exec>
 CHECK <filename> <filename>_
```

Filing commands: one of the lists

find and will keep the undesired ROM(s) off, not only through a hard break, but even through a power on reset! Users of the infamous Demon *Zromm* should note that, due to the usage of Demon workspace, problems may occur in using these functions whilst the *Zromm* is turned on. There is the standard command to list the ROM sockets' status, length in k and so on. However, another uncommon yet invaluable command can be found here which gives far more detailed information about the ROMs in your machine, right down to tube relocation addresses and binary versions. It is just such thoughtful additions to the run-of-the-mill toolkit commands that will push this ROM into many people's number one position. Also supplied in the ROM specific commands is an excellent routine to send any command line to a chosen ROM. This eliminates ROM clashes even in the worst of cases.

The utilities supplied for the Basic programmer are pretty standard, with the usual facilities to chop up the program, list function keys and so on. There is a no-frills Basic compacter and, interestingly, a program uncompacter to unravel the packed mess into intelligible code.

As mentioned earlier, some of the filing commands may function erroneously with popular DDFSs and ADFS; however, putting this aside, there are a number of useful utilities to be found here. Yet again, two commands I've not seen in other toolkit ROM chips of this type allow file encryption to a given password, rendering a program useless without the same password to unscramble it. Also we find a handful of commands which will record output to the screen; the data can be read back with the advantage of speed over routines that work using slow trigonometric functions.

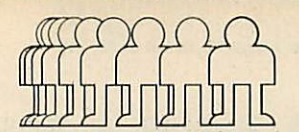
A rather disappointing disc sector editor is offered within this selection of commands as are the customary utilities which juggle with sectors, repair them, etc, and a menu-driven routine to transfer files between different filing systems (cassette, DFS, ADFS).

The last list of tools are those related to the operating system. The speed at which the disassembler scrolls is very impressive and it will disassemble both up and down through memory perfectly smoothly. Unfortunately no facility is provided actually to edit/assemble code; you can, however, enter the memory editor from this mode (and vice versa). The latter utility, like the sector editor, rather lets down the otherwise excellent routines.

At all times, the user can work in decimal, hex or binary. That covers the actual command set; but what of the general behaviour of *Mega-Rom*? Well, I have experienced no clashes (apart from that mentioned with the Demon *Zromm*), and would recommend that if purchased, *Mega-Rom* be positioned in a high priority socket so as to preside over other, less amiable ROMs.

To sum up, *Mega-Rom* is one of the more up-market toolkit ROMs currently available. Chalice has taken quite a large step in excluding a Basic program editor and the result is a far wider scope of commands than any other utility ROM can offer. A few of the routines let the side down, especially the disc and memory editors; but even this doesn't detract from the overall value. My advice is to buy *Mega-Rom* and complement its utilities with the *Basic Editor* from Acornsoft.

Mega-Rom toolkit £29.95 (16k ROM) available for B and B+, from: Chalice Software, Dept AU, 3 Merlin Way, Covingham, Swindon SN3 5AN.



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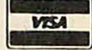
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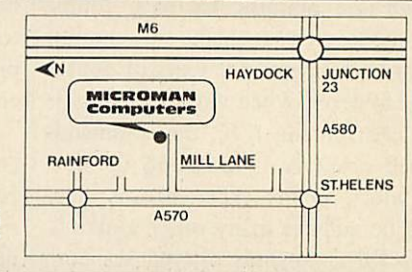
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HARDWARE

SECOND HALF

A 64k second processor at half the price of Acorn's? Benjamin Rietti puts the B2P through its paces

Many have criticised Acorn over the lack of memory in the BBC micro. That's where the idea of a second processor came in, but at almost £200, not every owner can afford one in order to make the most of the micro's outstanding capabilities.

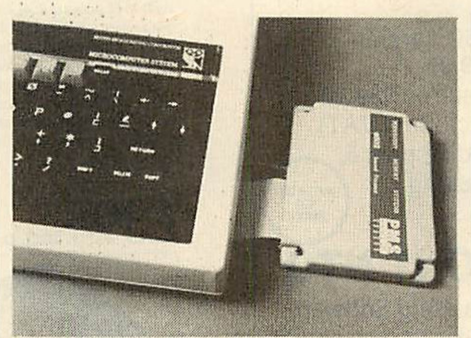
But the Scottish company Permanent Memory Systems (PMS) has now launched its own second processor at half that price.

You are not confronted with one of Acorn's infamous 'make it look really big, and leave over-sufficient room for ventilation' type boxes. Instead, there's a literally pocket-sized module held together with four screws, with a 6in ribbon cable trailing out. There is also a two-way wire for connection to the 1MHz bus socket.

Like the Acorn 6502 Second Processor, PMS has used a 65C02 chip, which includes the 65C02 op-codes which programmers can use to optimise speed and memory. The 16k ROM chip supplied includes commands to disassemble 65C02 and also transfer memory between Input/Output (I/O) and Tube processors.

The beauty of extending memory via a second processor is that there is no need for additional soldering or moving about of integrated circuits – it's just a case of 'plug in and go' – and the PMS B2P is no exception. The 16k EPROM chip supplied, termed 'the BOS ROM', must be fitted in a spare ROM socket inside the micro. This takes care of the interface between micro (I/O) and the second processor (Tube), also giving the user extra utility commands, including a full 65C02 disassembler and Tube memory editor.

After plugging in the Tube cable, the PMS B2P requires additional connection via the 1MHz bus. This is not necessary on the Acorn 6502 Second Processor because it contains the 'Tube ULA' which effectively deals with the high-speed memory transfer over the Tube port. This constitutes the bulk of the price difference between the two second processors, and therefore PMS had to bridge the gap using memory set aside for the 1MHz bus. This also explains why the PMS B2P only runs at 2MHz (as does the micro itself) whereas the Acorn one can run between 3MHz and 4MHz. The link is made via a lead plugging onto one of the pins on the 1MHz socket on the underside of the micro. If this port is already in use, for example with an EPROM programmer or Music 500, then PMS will supply, free of charge, a clip to be attached to a diode inside.



Low price, small box, high power

Despite the lack of Tube ULA, the PMS B2P is amazingly compatible with products originally intended for the Acorn beast. I have tried and tested several pieces of popular software and hardware, and found all the following to be compatible: ADT ROM, Tube *Elite*, AMX *Super Art*, *CommSoft*, *Hi-InterSheet*, *Ultracalc*, *View*, *ViewSheet*, *ViewStore*, *ViewSpell*, BitStik II, Music 500, and Music 5000.

In the case of *Wordwise +*, PMS has arranged with Computer Concepts to supply a special version that will relocate in their B2P giving over 48,000 characters free, with preview in 80 columns! This will only work with the PMS B2P (with *Wordwise +* fitted inside the main machine) and is sold for £6 by PMS.

Given compatibility with such products as RoboCom's Bitstik II, the cost of running the system is cut dramatically, opening up broader horizons and user bases.

The B2P will function equally well with both Acorn DFS and ADFS, including ACP's Advanced 1770 DFS. However, at the time of writing, it will not function properly using Econet, which will unfortunately cut out the educational market and the possibility of a cheap fileserver until PMS root out the problem.

The increased processing speed is very noticeable with graphics usage, and I have managed to attain up to a 65 per cent increase in speed. However, since the B2P is running at 2MHz, simple arithmetic algorithms can actually run slower using the B2P rather than I/O memory.

The main advantage in any second processor is the extra memory available – up to 44k for Basic (or 30k without Hi-Basic) and 60k for machine code applications. And you can do everything in high-resolution without losing user memory. *Hi-Wordwise+* and *Hi-View* (or *View* 3.0) will give 48k for text in 80 columns.

In Basic, PAGE is set to &800 for all applications. HIMEM would usually be &8000, although if using Hi-Basic, this is extended to &B800. PMS will supply Hi-Basic, either on disc or EPROM chip, for just £5. You do not require sideways RAM for the disc-based version, as the second processor will allow any language ROM to be loaded into its own RAM – typically at &8000, but if it is specially designed for second processor use, it can load higher, saving constant inserting and unplugging of fragile chips. Comal, Prolog, Lisp, Iso-Pascal and MicroText+ have all been tested, and work well on the B2P.

PMS's manual has been very well written. My only reservation here is the lack of explanation as to memory transfer over the Tube using the Acorn OSWORD calls – Acorn also neglected this point in its own manual, although PMS assure me they will include these details in the next edition.

Well, what more can I say? PMS has added to the Tube what Acorn missed out, supplying the necessary utilities to make control much easier and more user friendly. I have no hesitation whatsoever in giving it a firm thumbs up – high power, at low cost, and from a company renowned for its friendliness and policy of continual improvement to products. I hope it does as well as it deserves.

The PMS B2P 6502 Second Processor (for the BBC Model B only) costs £99.95 plus £2 post and packing from Permanent Memory Systems, 38 Mount Cameron Drive, St Leonards, East Kilbride G74 2ES.

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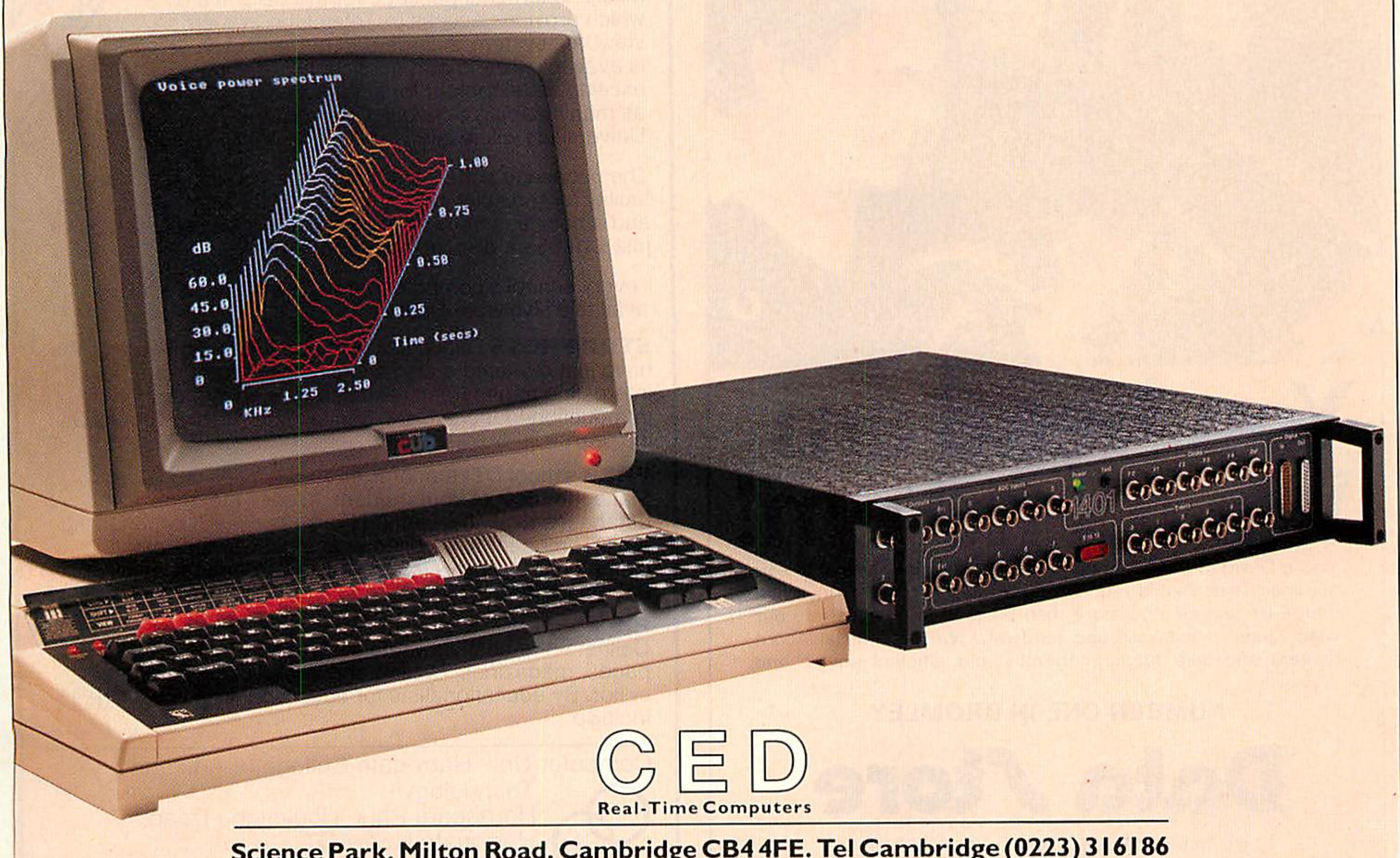
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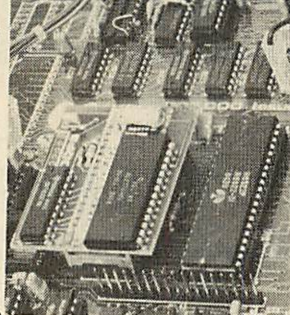
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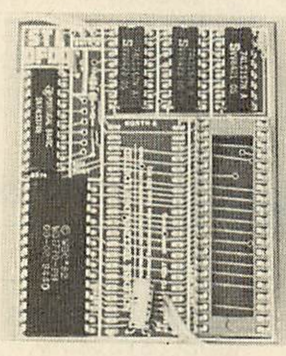
Double density disc interface

Solidisk very popular Double Density Disc Filing System (DDFS) is based on the WD-1770 floppy disc controller, the same chip used on the Beeb-Plus and the Master series, totally hardware compatible with Acorn 1770 DFS and ADFS ROMs. The DDFS is suitable for virtually any type of floppy disc drives, 3½" and 5¼", 40 track and 80 track, single and double-sided with or without power supply unit. New low price without DFS ROM .... £35.00 (order as XR/DDFS)



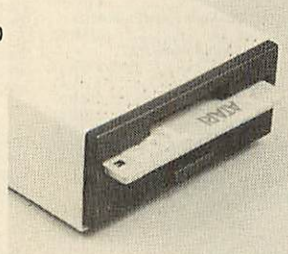
1770+8271, dual floppy disc controller interface

Solidisk DFDC (1770+8271) is the best seller in disc upgrades for Model B's already fitted with an INTEL 8271 chip (Acorn, Watford, Pace, Viglen, Cumana etc). It plugs into the 8271 socket with the latter relocated on the DFDC itself. This is the most convenient way of adding the modern and powerful 1770 without sacrificing the 8271 chip. The DFDC is fully hardware compatible with both Acorn DNFS 1.2 and ADFS ROMs, as well as Solidisk DFS 2.2 and ADFS 2.1 ROMs. The Acorn DNFS 1.2 is recommended for use jointly with the Solidisk ADFS 2.1 as both systems 'self-frugalise' to keep PAGE at the lowest value. We recommend the DFS 2.2 ROM alone if ADFS is not required. New low price without DFS ROM .... £40.00 (order as XR/DFDC)



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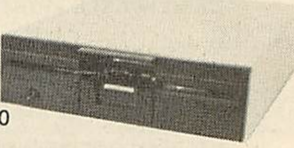
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The most powerful and versatile DFS ROM available for the BBC model B, the BBC Plus and the Master 128K. Suitable for both 8271 and 1770 Floppy Disc Controller. Double density allows up to 60% increase over conventional format or 640K storage per (80 track double-sided) disc. Extensive features include 40 and 80 track software switch, unlimited filenames in catalogue (as opposed to Acorn 31), automatic Read after Write. It works with Z80, 6502 second processors and Econet and also is very fast on comparative review benchmarks. Built-in commands include FORMAT (F40 and F80), VERIFY, DZAP, MZAP, RECOVER, RESTORE, WORD, RTRACK, WTRACK etc... Also, ENABLE M allows IBM PC discs to be read or written to. Extensive User Manual covers many technical details. Supplied on 16K EPROM.
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SOLIDISK FOURMEG 256K

The memory limit on the BBC micro can now be definitely a thing of the past. The new Solidisk Fourmeg board offers all you could wish for. It has 256K of extra RAM, a superfast 4MHz CMOS processor, sophisticated memory management sockets for high capacity ROMs and 32K of software in ROM. It is compatible with most hardware add-ons — except Sideways ROM expansion — which it replaces.
Fitting is easy. You remove the existing processor from its socket and plug the new board in its place, push on three colour-coded wires, clip on two mini hooks and its ready. Switch on the computer and you will immediately see the difference.
The message "Solidisk 256K expansion (4MHz)" announces the new memory size and speed.
A switch at the back lets you select between the old (2MHz) and the new (4MHz) speed.
The BBC micro at 4MHz easily surpasses the new Master 128K on benchmarks.
For example, it runs the benchmark using Basic 4 in only half the time taken on the Master 128K.
If you have too many Roms to plug in at once, the Fourmeg 256 offers two ways out. Firstly, it includes additional high capacity (and fast) ROM sockets. Moreover, two four normal ROM images can be stored in one high capacity ROM chip (by "vertical paging") — so more can be made immediately available to your fingertips.
Secondly, ROM images can be stored on disks and loaded into any one of the eight Sideways Ram banks available. If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks. No user memory is then lost to the screen, whatever the screen mode.
You can turn the extra memory into a RAMDISC or a printer buffer by simple star commands. A Silicon disk of 200K, compatible with both the Solidisk DFS and ADFS formats replaces then one of the 4 physical disc drives. The Ramdisk is at least 10 times faster than physical disk drives and has no moving parts. The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.
It is the most logical next step for owners of any Sideways ROM board or Solidisk Sideways Ram, who can trade in their present boards for the excellent Fourmeg 256.
To complement such a powerful product, Solidisk recommend Computer Concepts Wordwise Plus and Interword.

BEEB 256 PRICES:

TWO MEG 256, 16K MANAGER ROM	£115.00
TWO MEG 256, WITH WORDWISE +	£145.00
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Shadow Sideways ROM and Sideways RAM All in One for £50:

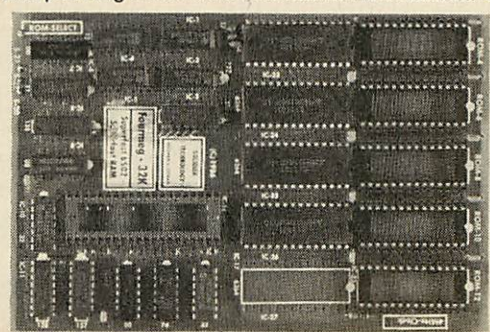
This board, the TWOMEG 32K, is specifically designed with the school BEEB in mind so that one can have everything required on a single, compact and extremely easy to install unit. All the necessary software is in a MANAGER ROM (supplied).

The top row of five ROM sockets will take software ROMs, up to 32K each, such as used on the BBC Plus and the MASTER 128K.

The middle row contains 32K of additional CMOS, low power RAM, acting as Shadow Ram or as two banks of Sideways Ram.

The empty 40 pin socket will receive either the normal 2MHz CPU or the optional enhanced, faster 4MHz CMOS 6502 (the board will then be called the FOURMEG 32K).
The TWOMEG 32K combines the usual functions of a Sideways ROM board — offering storage for up to 160K on board and 64K on the BEEB itself (a total of 224K out of 256K possible) and a SHADOW RAM compatible with major language ROMs such as BASIC, VIEW, WORDWISE, INTERWORD, VIEWSHEET, VIEWSTORE etc.
When Shadow Ram is in use, a small 8K of Sideways RAM is available for loading ROM images or a small printer buffer. When SHADOW RAM is not in use, the entire 32K additional RAM can be used as two banks of SIDEWAYS RAM or as a RAMDISC (available only with Solidisk DFS or ADFS). The Manager ROM also contains a Toolkit to assist programming in BASIC.
The attraction of the TWOMEG-32K board comes from its versatility, its convenient software in ROM and its low pricetag. Furthermore, the board can be fitted with a CMOS 65C02 capable for example of running the new BASIC 4 (some 30 per cent faster than BASIC 2 and also more accurate) or upgraded to FOURMEG speed, comparable to the TURBO board on the Master.

Twomeg 32K	£50.00
65C02 (2MHz) for the above	£10.00
Or upgrade to fourmeg	£25.00
Fourmeg 32K	£70.00
Post and packing	£2.00



SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

MASTER SERIES:

AMB15	Master 128	499.00
ADB12	Master ET	399.00
ADC06	Turbo Upgrade	125
ADC08	80126/512K	228.00
ADF13	Eprom cartridge	14.95

MANUALS AND DOCUMENTATION:

ADJ22	Ref manual Pt 1	14.95
ADJ23	Ref manual Pt 2	14.95

MASTER COMPACT SERIES:

ADB20	Master Compact Single drive	441.25
ADB20+ADF30	Master Compact S/D with TV mod.	467.35
ADB20+ADF31	Master Compact S/D with Mono monitor	537.85
ADB20+ADF32	Master Compact S/D with Colour monitor	687.35
ADF15	RS232 kit	29.90
ADF16	Second 3.5" floppy drive	113.85
ADF17	PAL TV Adaptor	29.90

ACORN SOFTWARE:

SUB27	Viewstore database ROM	59.80
SUB18	Pascal	69.00
	FORTH	19.90
	LISP	19.90
	MICRO-PROLOG	79.95

SOLIDISK SOFTWARE ROMS:

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PCMAN	MANUAL FOR PCFS	5.00
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INSIGHT	Intelligent disassembler, XREF	20.00
UVP	Eprom programmer software (8k)	5.00

ECONET PRODUCTS:

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AEH18	10station lead set	29.00
AEH19	Econet starter kit	99.00
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AEH21	Econet socket kit	29.95
AES21	Level 2 Fileserver	249.00
AES22	Printer server ROM	49.00

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TWIN35	Twin DF35	£200.00
FD525	5.25" 80-track double-sided single drive	£115.00
TWIN525	Twin FD525	£230.00
20MB	Winchester new model, low cost SEAGATE	£700.00

PRINTERS:

LX86	EPSON LX86 + 2M printer lead	249.00
LXTF	LX80 Tractor Feed	31.30
LXCSF	LX80 Cut Sheet Feeder	53.53
FX85	EPSON FX85 NLQ + 2M printer lead	350.00
FXTF	FX85 Tractor Feed	30.59
FXCSF	FX85 Cut Sheet Feeder	123.50
NL10	STAR 80 col-120 cps par. 2M lead	289.00
NLCSF	Cut Sheet Feeder for NL-10	59.99
NLRIB	Black Ribbon for NL 10	5.64
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TAXAN3	12" TAXAN Supervision 3, hi-res RGB Colour, lead	375.00
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SOFTWARE PACKS:

SWPK1	5 software discs, 80 track. Database, spelling checker, machine code monitor, Macro Basic etc. 5.25" format	£10.00
	3.5" format	£15.00
SWPK2	5 software discs, 80 track. Games. 5.25" format	£10.00
	3.5" format	£15.00

DISKETTES:

MD525	5¼" low cost VEREX for all drives	12.00
MD557	5¼" hi-rel MD557, Verbatim DSDD 96tpi	25.00
C102	3.5" low cost Verbatim for all drives	20.00
C103	3.5" hi-rel 90097M Vertbatim DSDD 135 tpi	28.00
C104	3" CF2/MSOFT for all Amstrad drives	39.00

CARTRIDGES:

ADF13	Acorn Eprom cartridge for two 27128	14.95
EPR32	Solidisk Eprom cartridge for one 27256	8.00
RAM32	Solidisk 32K RAM cartridge with battery backup and write protect switch	25.00
MEGA256	Solidisk 256K Mega-RAM card with RAM disc and printer buffer in ROM	100.00
MEGA256	Solidisk 1 Megabyte Mega-RAM card with RAM disc and printer buffer in ROM	POA
	Expected price in April/May	225.00

EXTRA DISCOUNT

If you buy a disc drive or a printer or a monitor at the same time you buy a Master or a Compact, you are qualified for SYSTEM DISCOUNT and a free Software Pack 1 (worth £10.00 or more).

Normal Package Price	System Discount	Reduction
£600-£699	3%	£18-£21
£700-£799	4%	£28-£32
£800-£899	5%	£40-£45
£900-£999	6%	£54-£60
£1000 and above	7%	£70-£££

Example of system		normal price	Discount	Net price
1	Compact Mono + MP165 printer	797.85	31.95	765.94
2	Compact Colour + Juki 6100	1027.35	71.89	955.11
3	Master 128 + twin F/Drives	729.00	29.16	699.84
4	Master 128, twin F/Drives, CM8533 Colour monitor	1028.00	71.96	956.04
5	example 4 + MP165 printer	1288.00	90.15	1197-84
6	Master 512 + twin F/Drives	957.00	57.42	899.58
7	Master 512 + twin F/Drives, plus 20 MB Winchester	1657.00	115.99	1541.01

SECONDHAND BEEB AND UPGRADE TO MASTER:

We buy and sell good condition second hand Beebs, even by post. Proof of original purchase is required if you are only selling your computer. Reduced commission is available if you are UPGRADING your BBC to a Master, ask for a MASTERPLAN quotation.

BBC Model	we buy at	we sell at
B-issue 2	131	175
B-issue 3	191	225
B-issue 4	187	250
B-issue 7	225	300

The prices above are given as average for very clean and good condition machines. Please ring for stock allocation before you call.

ORDERING BY POST:

All items can be ordered by post, sending the coupon below and enclosing cheques, POs, drafts or credit card numbers or by phone. P and P is charged as follows:
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Up to 3 KGs (eg single disc drives): **£3.00**
Up to 10KGs (eg computer, monitors, printers, twin disc drives): you can specify either parcel post £6.00 or courrier/Datapost: **£12.00.**
Above 10KGs (eg complete system), please either allow generously or give us a ring for quotation.

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17 Sweyne Avenue
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Address: ....

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Items: ....

Price: .... P & P: £2/£3/£6/£12

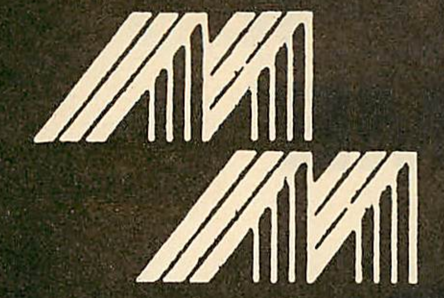
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Access/Barclay:

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Tel: Southend (0702) 354674 (16 lines).

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View Plot	£29.95
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AMX 3D-Zicon	£24.95
AMX Database	£24.95
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Forth ROM	£49.85
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Micro Prolog ROM	£73.00

Computers

BBC Master 128k	£454.00
BBC Compact Colour system	£687.35
PAL TV Adaptor	£24.90
BBC Compact entry system	£441.25
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Micros in Business	£69.00
Aviator	£17.65
Revs	£17.65
Master Elite	£19.95
View Index Disc	£14.00
Hi View Disc	£50.00
Printer Driver Generator Disc	£11.50

Printers

Epson LX86 NLQ Printer	£270.00
Tractor Feed Unit	£17.00
Star NL10 with Parallel Interface	£260.00
BBC to Centronics Printer Cable	£9.00

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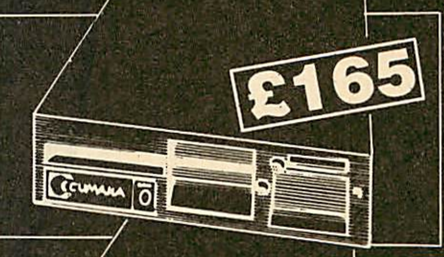
CD 800

5¼" Double-sided 800K dual disk drive 40/80 track switchable with own Pwer supply



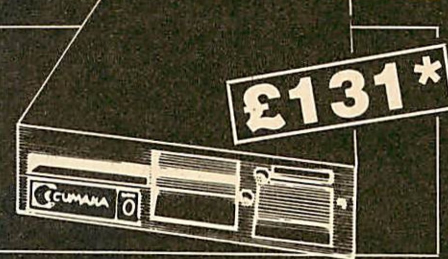
CS 400

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CD800/S 40T/80T dual with psu	£269*
.... DFS Kit (unfitted)	£69.00
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Cumana QFS Double Density Kit	£39.95

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Microvitec 1431 Standard	£205.00
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NEWS

Positive IBA strategy for schools

The Independent Broadcasting Authority is making a concerted effort to have its policies on microelectronics in education noticed. Its recent policy document, *Micros in Education*, attempts to show that the IBA is following a positive course.

The document acknowledges the dominance of the BBC computer system in schools and indeed it includes a summary of a BBC/IBA survey which shows the proportions of micros in school (see table). Although a project was started to produce an 'ITV Micro', this was found to be impractical. So the IBA has concentrated its efforts on supporting schools with broadcasting and associated software projects.

The TV programmes have included *Database, Me and My Micro* and *4 Computer Buffs*. The school broadcasting sector has also included several computer-related series. *Seeing and Doing*, for age six and upwards, involves a variety of problem-solving and Logo-based activities, with associated software. *Junior Maths*, *The Micro at Work* and *The English Programme* all make links to associated software that is available in schools. *How We Used to Live*, which is now supported by 11 computer programs available from Yorkshire Television, covers social history from 1874 to 1953, with plans to continue to 1970. *Science and Technology* and *Craft, Design and Technology* both now have computer programs either available or in the process of production. In addition, the *Geography Today* and *Animals in Action* programmes are being supported by datafile packages for use with Inform, Quest and the newest arrival on the scene, *Key*.

Key is a data-handling package which is aimed at both primary and secondary schools, and available for both Acorn and RML machines.

Two things are surprising about this package: its price and the scope of its facilities. It costs an amazing £4.95, yet offers the following:

- The use of a command language or three-key operation
- The ability to extend and rebuild files
- The use of either disc or internal memory
- The ability to store records in picture form
- A full graphics package including extensive statistical analysis and mapping
- A utility to integrate datafiles from other packages.

This extensive and heavily subsidised package is designed to make a hole in the data-handling market which will leave ITV with a substantial customer base. If *Key* takes off, it is likely to displace some of its rivals simply because of its flexibility and its incorporation of facilities which are either non-existent or available only as supplementary utilities on other packages.

Although BBC Soft has produced excellent software, a dedicated BBC data-handling system has yet to emerge. The signs are that this 'tools' part of the market is going to become the battleground between the two broadcasting services. The winner of the battle will be determined by the level of relevance to classroom application and the support provided in the school curriculum.

Key is available from ITCA Ltd, 6 Paul Street, London EC2A 4JH.

	Primary		Secondary
UK schools equipped with micros	95%		99%
In equipped schools:			
Average no. of micros	1.9		13
Acorn/BBC B	85%		89%
RML	14%		59%
Spectrum	9%		23%
Other models:	7%		44%
Commodore PET		15%	
Apple		11%	
ZX81		7%	
Electron		5%	
Commodore 64		4%	
RML Nimbus		3%	
Tandy TRS 80		2%	
VIC 20		2%	
IBM		1%	

Per cent and type of micros in UK schools

EDUCATION TOP FIVE

	Title	Publisher	Cassette	Disc	ROM	Electron	B+	Master	6502	Econet
1	Speech!	Superior	£9.95	£11.95	—	—	Yes	Yes	—	Yes
2	Answer Back Junior	Kosmos	£9.95	£10.95 (5.25in) £12.95 (3.5in)	—	Yes	Yes	Yes	Yes	Yes
3	Answer Back Senior	Kosmos	£9.95	£10.95 (5.25in) £12.95 (3.5in)	—	Yes	Yes	Yes	Yes	Yes
4	Best 4 Languages	ASK	£19.95	£19.95	—	Yes	Yes	Yes	—	—
5	Happy Letters	Bourne	£9.95	£14.95	—	Yes	Yes	Yes	—	Yes

Compiled by Gallop/MicroScope. Publishers: Superior Software, Regent House, Skinner Lane, Leeds 7. Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Beds LU5 6LY. ASK, London House, Upper Richmond Road, London SW15. Bourne Education Software, Bourne House, The Hundred, Romsey, Hants, SO5 8BY.

NEWS

Knitting program

Newsight Ltd is an MSC-supported organisation which trains people in the fundamentals of design and art. It covers a wide range of techniques including photography, weaving, textile printing and knitting. Knitting has been the focus of a project to develop a program which will generate patterns specific to designs made using a CAD package.

Knitting Softwear (*sic*) runs on the BBC micro and allows the user to create three-colour designs which can then be converted into a pattern for a sleeveless pullover. More expert knitters will be able to add the necessary stitches to create sleeves as well. The designs may be created using the tesselation facility, sketching and colour filling, random kaleidoscope patterns or computer-generated wave patterns. The measurements of the wearer are added and the picture of the design and the knitting instructions are then dumped on an Epson-compatible printer. Moreover, the individual stitch patterns of the garment may be printed allowing the design of cards for knitting machines.

Doreen Davies, the proprietor of Newsight, has also used the program to create designs for transfer to other types of textile. This software, a valuable resource for all people, regardless of sex, is likely to be a winner. Davies has managed to get a variety of institutions interested in the program, including prisons, many hospitals and educational institutions of all kinds.

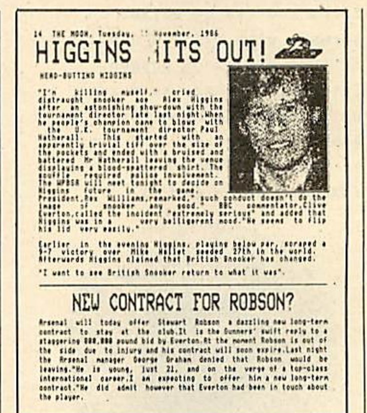
Doreen Davies may be contacted at Newsight Ltd, 340 Clapham Road, Stockwell, London SW9 9AT.

Hold the front page!

Bishop Grosseteste College in Lincoln was the venue recently for the publication of two newspapers – *The Moon* and *The Comet*. What makes these two journals interesting is that they were produced by two staffs drawn from education. Each team of around 50 people was assigned the task of collecting news, views, pictures and features from around Lincoln and producing a newspaper by five o'clock in the evening. Both teams produced copies running to 14 pages.

The newspapers were produced using wordprocessors and *Pagemaker* on BBC micros. They made use of a full video-digitising service which was used to 'grab' screens from the TV news. The Linear Graphics Scanner was also used to digitise drawings and photographs from newspapers.

Text was produced by the reporters on *View*, edited by copy editors, then sent through to the compositors who spooled it into *Pagemaker*, fitting it around the graphics and



14 THE MOON, Tuesday, [illegible] November, 1986

HIGGINS [illegible]ITS OUT!

HEAD-BUTTING HIGGINS

"I'm killing myself," cried distraught snooker ace Alex Higgins after an astonishing show-down with the tournament director late last night. When he people's champion came to blows with the U.K. tournament director Paul Hatherall. This started with an apparently trivial tiff over the size of the pockets and ended with a bruised and battered Mr Hatherall leaving the venue displaying a blood-spattered shirt. The scuffle required police involvement. The WPBSA will meet tonight to decide on Higgins future in the game. President, Rex Williams, remarked," such conduct doesn't do the image of snooker any good." BBC commentator, Clive Everton, called the incident "extremely serious" and added that Higgins was in a very belligerent mood. "He seems to flip his lid very easily."

Earlier in the evening Higgins, playing below par, scraped a 9-7 victory over Mike Hallet seeded 27th in the world. Afterwards Higgins claimed that British Snooker has changed.

"I want to see British Snooker return to what it was".

NEW CONTRACT FOR ROBSON?

Arsenal will today offer Stewart Robson a dazzling new long-term contract to stay at the club. It is the Gunners' swift reply to a staggering [illegible] pound bid by Everton. At the moment Robson is out of the side due to injury and his contract will soon expire. Last night the Arsenal manager George Graham denied that Robson would be leaving. "He is young, just 21, and on the verge of a top-class international career. I am expecting to offer him a new long-term contract." He did admit however that Everton had been in touch about the player.

photos which had been collected by the other teams.

This, the second of such simulations organised by Derek Maxted and his colleagues at the college, involved both teachers and children from schools in the region. The point of the simulation was to bring home the impact of new technology on the world around us and to stimulate an interest in using it in the classroom. The exercise was observed by representatives from other parts of the country with a view to other Education Authorities undertaking such work.

Desktop publishing is increasingly becoming a powerful tool in the classroom as well as in the outside world. However, debate continues as to the usefulness of such packages in the classroom. The problem tends to be that the memory limitation in BBC machines makes it necessary for software to perform tricks to achieve its ends. Thus the extensive use of disc memory and 'panelling' for the creation of a single A4 document means that an abnormal amount of disc access has to be undertaken by the user of either major package (*Fleet Street Editor* or *Pagemaker*). Derek Maxted's exercise reduces the problems in that it allows teachers and pupils to see the package in action, to understand its facilities and why they have been provided, and to show that the problems of the packages are far outweighed by the end results which may be obtained. For further information, contact Derek Maxted at MEDU, Bishop Grosseteste College, Newport, Lincoln LN1 3DY.

Selectors extend micro use

Care Electronics produces a range of equipment likely to make school computer rooms easier to manage.

There is a variety of switchers and selectors designed to extend the use of both user and printer ports.

The two-to-one user port switcher (£37.95) allows the connection of two user port devices to the same unit, allowing them to be selected by push button, thus reducing wear on the user port itself.

Care's printer port two-to-one switch (£34.50) will connect two micros to one printer or two printers to one micro.

A six-to-one version of both of the above is available at £80.50. All the units are cased in stove-enamelled steel boxes which can be fastened down to work surfaces for safety.

Care also supplies a range of cartridges for the Master which, as well as providing the normal ROM-carrying functions, also allow the use of the former model B cartridge system on the Master.

An EPROM programmer will be available soon fitting into the Master cartridge slot and thus dispensing with the need for separate units. The programmer is likely to retail at a price around £57.50.

All this equipment is robust enough for the classroom and also provides a means to reduce the repeated wear on the computers caused by the continual connection and disconnection of plugs and ROMs into the BBC micro.

Contact Care Electronics, 800 St Albans Road, Garston, Watford WD2 6NL. Tel: (0923) 672102.

EDUCATION

EXTEND YOUR OUTPUT

There are many input and output devices which can greatly improve computer performance in class

[redacted]

Chris Drage and Nick Evans

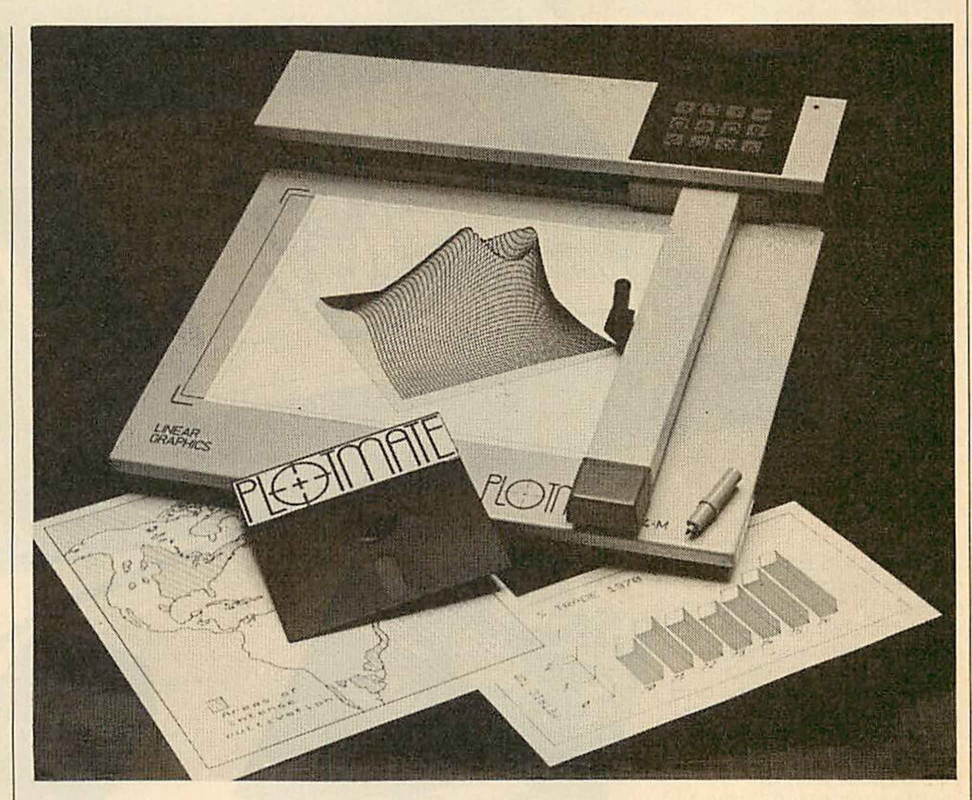
A computer on its own is useless. It has to be able to 'talk' to other equipment and receive information from the outside world through input devices. At the most basic level, you need a monitor to see what is happening and a tape recorder (heaven forbid!) or a disc drive to load and save programs and files of information. All of this seems obvious until you begin to consider the possibilities of alternative input and output devices. This article looks at some ideas for extending your classroom kit which take into consideration additional bonuses gleaned from use at the chalk face.

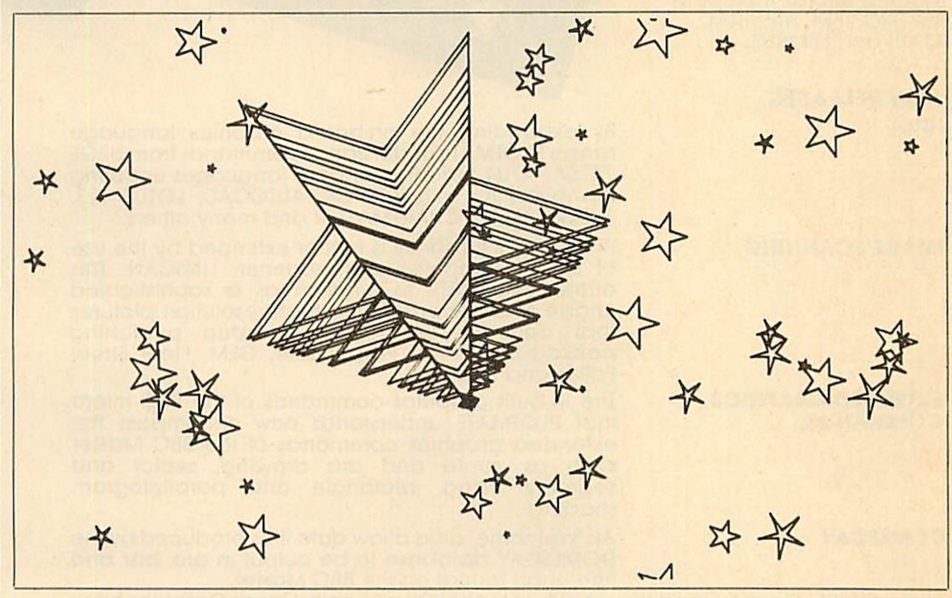
Output devices for Logo work

Turtles Many teachers underestimate the value of a robot turtle in the classroom. Many recognise it is a simple extension to, or a personification of, the screen turtle. But its impact on young children should not be overlooked. They get a thrill from seeing their programs developing complex patterns and shapes on large sheets of paper, which are then discussed and displayed. A turtle provides concrete experience in the school's Logo programme and is an object children can identify with.

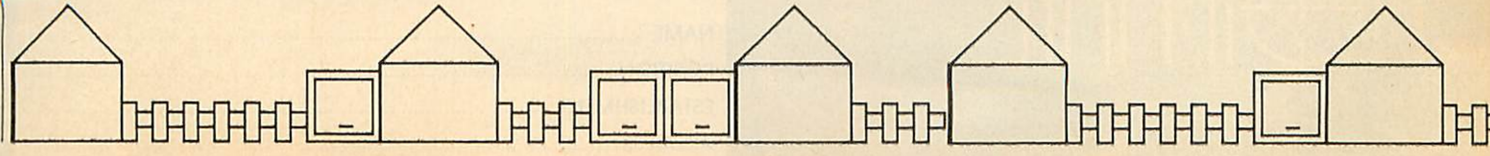
Which turtle should you use? Of the two models formerly available, the Jessop Turtle and the Valiant Turtle, only the former survives. The latter company is now out of business – although at the time of writing, the Valiant Turtle is rumoured to be making a comeback. Experience has taught us that infra-red turtles (with rechargeable batteries) can be problematical and somewhat unreliable. So the simple, umbilical-cord Jessop-Ralph Turtle is the obvious choice today.

In the infant school there is tremendous scope for the turtle as an



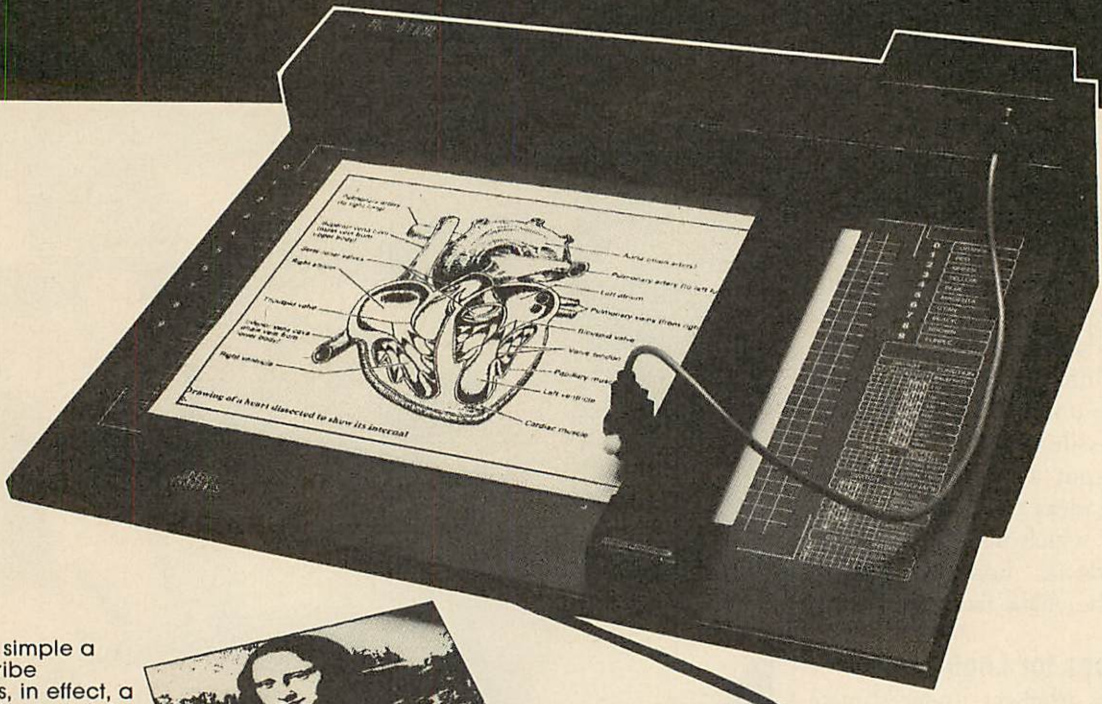


The Plotmate plotter from Linear Graphics (top) provides excellent output of Logo work. The line drawings above and below were produced by children, using a Plotmate



PLOTMATE

A Graphic Illustration



PLOTMATE A3M with Linear Graphics' high resolution image scanner — LINSCAN.

'Plotter' is too simple a word to describe PLOTMATE. It is, in effect, a highly sophisticated data communications device that greatly extends a micro system's options and capabilities allowing high resolution input and high definition output. It is compatible with all leading micros including the BBC, IBM, AMSTRAD, ATARI and NIMBUS.

NEW RELEASES

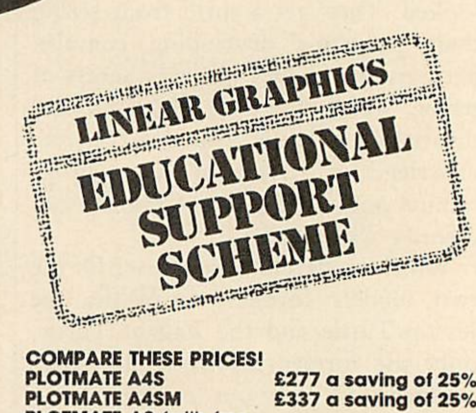
HPGL
By expanding the on-board graphics language range PLOTMATE understands commands from HPGL 7475A/7470A industry standard languages enabling compatibility with BITSTICK, AUTOCAD, LOTUS 123, SUPERCALC 3, CHARTMASTER and many others.

IMAGE SCANNING
PLOTMATE's flexibility is further extended by the use of Linear Graphics' own scanner, LINSCAN. This allows PLOTMATE to function as a sophisticated image scanner producing high resolution pictures that can be used within desktop publishing packages such as Pagemaker, GEM, Fleet Street Editor and Image.

EXTENDED GRAPHICS COMMANDS
The in-built graphics commands of the BBC micro that PLOTMATE understands now encompass the extended graphics commands of the BBC Master such as circle and arc drawing, sector and segment filling, rectangle and parallelogram shading.

DOMESDAY
All 'Welcome' disks allow data files produced by the DOMESDAY database to be output in pie, bar and line chart format on the BBC Master.

Not content with providing this wealth of technical capacity Linear Graphics have even introduced a unique discount scheme for primary and secondary schools — the 'Educational Support Scheme.'



COMPARE THESE PRICES!

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adventurer, using simple classroom equipment – bricks, junk, models and the children's imagination! The list of scenarios is endless and can lead to inventive and imaginative written and art work.

Plotmate plotter For classrooms without the space for a turtle to trundle about, a plotter is an alternative way of providing children with hard copy of their Logo turtle work. The A4 Plotmate plotter from Linear Graphics is compact, reliable, extremely accurate and, above all, simple to operate. Plotter driver software is available on disc, from where it must be copied to Logo work discs. The ROM version contains driver software in situ. The Plotmate manual contains two simple Logo procedures, called Plotmate and Plotend, to direct output to the plotter.

The plotter software now works perfectly with all the Logotron graphic primitives, commands and procedures – although earlier versions used to hang up if they encountered HT (hide turtle) or ST (show turtle). Linear Graphics have modified the firmware to accommodate these.

Compared with the turtle, the Plotmate's output is remarkably accurate. Floor turtles can never give a really perfect output with long or complicated designs: there are too many factors present which result in small inaccuracies. For older children struggling to get their complex designs to look 'just right' this can be a frustration. This is not to dismiss the value of the turtle, for, as stated above, with young children it is arguably the best Logo output device. For only the floor turtle can actually obey 'RIGHT 90' by turning 90 degrees. With a Plotmate, children do need to be able to conceptualise the 'turtle' (plotter pen) turning when in fact it isn't.

An advantage of an A4-sized plotter is that the finished copy can be popped immediately into Logo work folders. The best paper on which to plot is a glossy 80 to 90 gram type. The small supply included with the plotter is very quickly consumed. A cheap solution to this normally expensive commodity may be at hand in the school already, namely spirit duplicator master sheets.

The basic A4 Plotmate costs £224 (plus VAT) under Linear Graphics' Education Support Scheme. This is more expensive than the Jessop-Ralph Turtle. However, with a Plotmate you are getting far more than a Logo Plotter. For example, there are the *Linsign* sign-designing program and *Linmap* picture digitiser, two items of software with wide applications in both primary and secondary school. For a detailed description, read Joe Telford's review of plotters in the December 1985 issue of *Acorn User*. The Plotmate's versatility, coupled with the superb support from the manufacturer, result in a highly recommended machine.

TURTLES AND PLOTTERS

Turtles are robot devices which have been around for over 10 years, since Seymour Papert suggested they were suitable 'objects to think with' for young children using Logo.

The robot is simply constructed. There are two motors to drive the wheels and another to lift the pen up and down. There is also a small speaker and a printed circuit board. All of this is contained under a perspex dome through which all the workings can be viewed. A ribbon cable and an interface box connect the turtle to the BBC micro's user port. Other turtles (the Valiant Turtle for example) are battery driven and controlled by infra-red signals but these have proved to be unreliable. However, for turtles connected via a cable, care must be taken not to get the cable tangled.

The turtle is placed on a large sheet of paper on the floor and it will then draw large Logo designs. A disadvantage of using the turtle is that it does take up valuable floor space in the classroom and furniture will have to be moved to see it function. As regards accuracy, a simple way to test the turtle is by getting it to draw a square. If the fourth side does not meet up with the first, then the device can be fine-tuned. The wheel track is simply adjusted with a spanner.

As well as introducing the children to programming and elementary geometry, they can gain an understanding of robotics and control by using a turtle.

Plotters are also devices with which to represent Logo work on paper. They have an advantage over turtles in that they do not occupy much needed space. The Logo output is similar to that of a turtle but obviously smaller.

A plotter typically uses A4 or A3 paper sheets and can be easily set up on a desk. It has an arm protruding from its main body which is controlled by a two-dimensional mechanism and moves in X and Y directions over the paper.

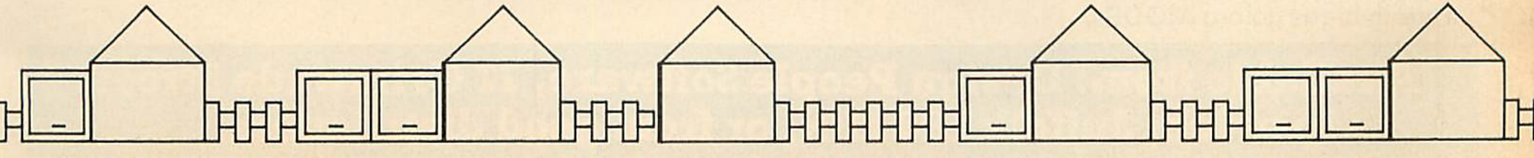
Plotmate from Linear Graphics has only one pen holder, so for multicoloured work, pens will have to be changed. The Plotmate plotter is very simple to use and also quick.

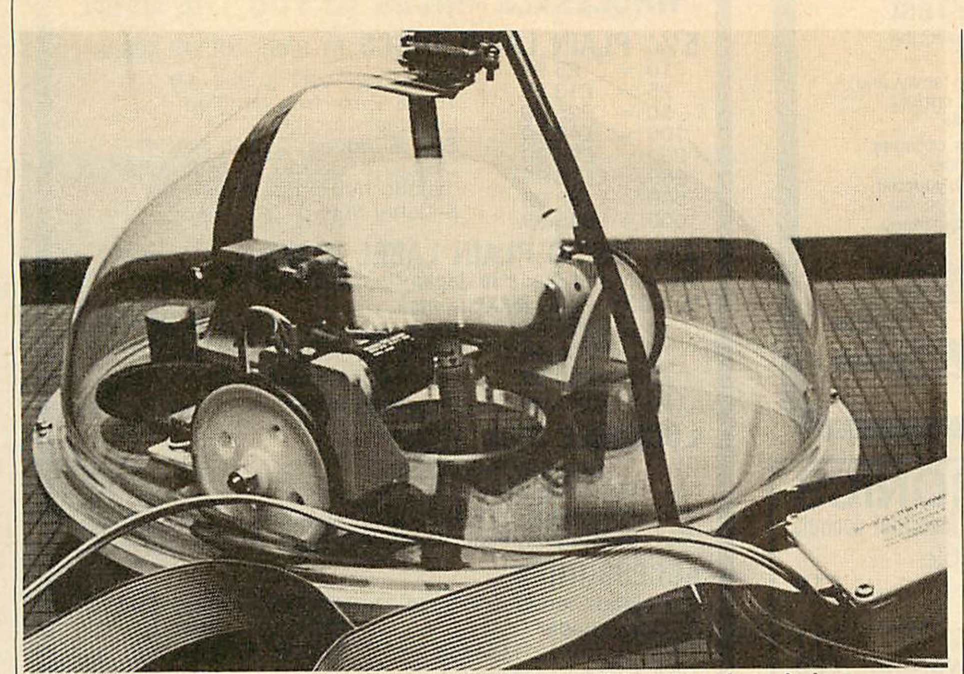
Input devices

Keyboards It is not just the pre-reader who benefits from devices such as the Concept Keyboard, although its origins undoubtedly sprang from a need to enable children who were not literate to communicate with the computer. Now software companies have produced materials which aim at the secondary market as well as primary.

This type of keyboard consists of a surface divided into a grid which is touch-sensitive. Over this surface the user may place an overlay containing various defined areas. These are linked to responses made by the computer when that area is touched. So, for example, characters in a game may be selected, a discrete set of keys may be identified by large squares on the grid or whole areas may be mapped out for one particular response when the user is severely disabled.

It is also interesting to note that the Concept Keyboard idea is one which is used with great regularity in commerce and industry. Order at the counter of any McDonald's restaurant and the counter assistant will be identifying choices by touching a similar type of keypad. Banks, airline terminals and a host of other users exploit this type of keypad because of its simplicity and the ease of cleaning.




The Jessop turtle, connected by ribbon cable to the micro, will draw large Logo designs

Star Devices, the software arm of AB European Marketing who make the board, have spread their wings beyond primary schools with projects to interest a wide range of people. The *Key to the Stars* program for example, displays the night sky from any point on earth at any time of day or night in any year! It includes astrological charts and a wealth of other facilities. The *Concept Toolkit* provides a simple interactive means of editing sound envelopes and parameters and creating user-defined graphics. In addition, adventure games, electronics, energy conservation and ecology are to be found in the secondary *Concept Introductory Pack*.

Finally, an exciting project is under way (and expected after Easter) which will emulate the cash till found in supermarkets. This program is not that simple, however, since it is linked into a stock control simulation and concepts of general computerised financial and ordering management.

Telextext Adapter Many people dismiss television teletext as third-rate Prestel without the electronic mail. Yet it is capable of providing not only a low-cost information service but also a great deal of free software. This comes as a natural consequence of the teletext systems which broadcast software as a part of their normal broadcast services. This can only be received by means of a teletext adapter which connects to the micro. It converts the top part of the TV signal into the codes necessary for the creation of screens of information. Some of these screens comprise part of software packages which are mostly transmitted for educational use.

The easiest to use is the Morley Teletext Adapter, for the simple reason that it contains no moving parts! Its tuning is self-seeking through software control, so it is possible to allow the computer to home in to the strongest signal for any particular station then, if needed, fine tune it to get the best signal. All the data for tuning is stored on disc, so there are no knobs and buttons for inquisitive little fingers to jiggle about. Moreover, it is possible to have discs containing different tuned settings to correspond to different atmospheric conditions. This is particularly useful if you have problems in tuning in during wet weather, for example, since a second station may come through with a stronger signal.

The Morley Adapter is also small, the size of a single disc drive, and runs from the disc-drive power socket, which means that there are no extra mains power leads to get in the way. It connects to the user port. If your user port is already occupied, try the Care Electronics User Port Extension which allows two or six user port devices to be connected and selected at any time.

Oberon Omnireader This text reader came onto the market a little while ago and was hailed as a significant advance in computer technology. It enables the user to scan passages of print which are then transferred into computer memory. This means that, in theory, computer listings could be scanned and entered in without too many errors. But in practice the Omnireader is much more fussy than that. It will only recognise a limited number of character sets, and that only at certain specific sizes.

However, the reason for writing about it here is that the company, which recently went into liquidation, sold off all its Omnireaders at £40 or £50. Many enterprising people have snapped these up to develop a variety of applications. We would be interested to hear of any school users who have 'tamed the beast' as well as finding useful applications for it in the classroom. It will not be long before another company comes out with a text scanner.

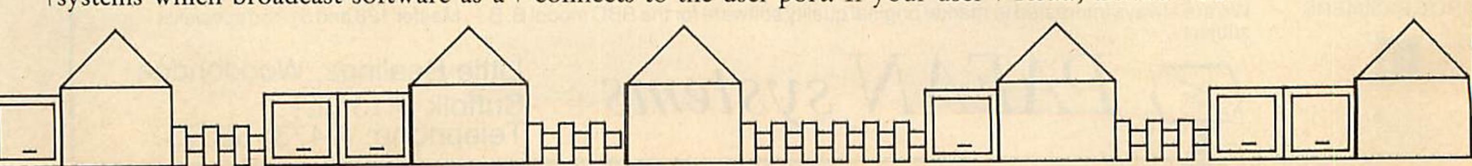
The Jessop Turtle is available from Jessop-Ralph Ltd, Unit 5, Long Street, London E2 8HN. Tel: 01-739 3232. The price is £175 (or £210 including Logotron Logo).

Plotmate plotters are available from Linear Graphics, 28 Purdeys Way, Rochford, Essex SS4 1NE. Tel: (0702) 541663. Price (education support scheme): A4 – £224 + VAT, A4M – £299 + VAT, A3 – £299 + VAT and A3M – £426 + VAT.

The Concept Keyboard is available from AB European Marketing, Wharfdale Road, Pentwyn, Cardiff CF2 7HB. Tel: (0222) 733485.

The Morley Teletext Adapter is available from Morley Electronics, Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne and Wear NE28 6BY. Tel: 091-262 7507.

The Oberon Omnireader is available (if there are any left!) from Metroheath Ltd, 287-289 Whitechapel Road, London E1.



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The print routines allow separate printouts of each side of the PCB in a very accurate expanded definition 1:1 or 2:1 scale, enabling direct contact printing to be used on resist covered copper clad board.

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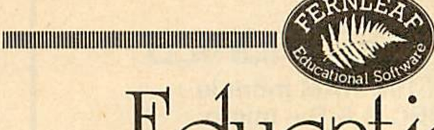
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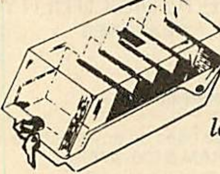
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NEW IMPROVED VERSION (1.40)
Send £2.00 with old disk for upgrade.

PLEASE SPECITY DFS

Prices: £12.00 each for Vector 1 or Vector 2 £23 for both.

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All prices shown include VAT and p&p. Please add £3.00 per disk if you require 3" disks and specify when ordering.

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All ports are standard Master 128 fitting.

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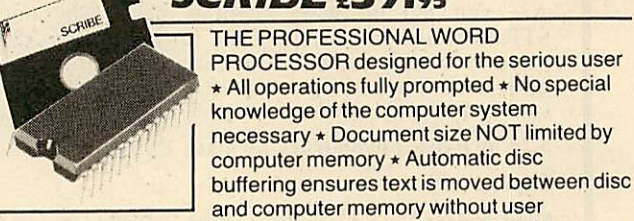
★ User port interrupts ★ Analogue/Joystick processing
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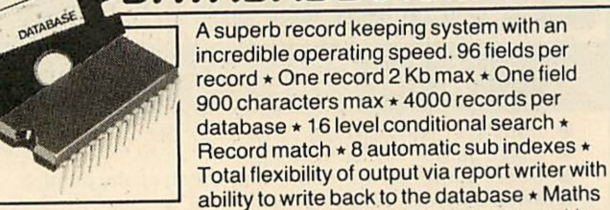
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The System utility from KM Software Ltd

Extra commands for BBC B & Master users, Master features include CMOS editor, CHARSET to move the character set into private ram, PVIEW private ram editor.

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Also available KM'S Sound to Light converter, This chip contains 10 different screens with an amazing 63 colours and responds instantly to sound input to the cassette port. Just play your favourite music and watch the colours and patterns flow.

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Are you fed up with Zapping aliens why not try STRATAGEN a strategy game for two to four players using colourful graphics as pieces on a large 10 by 8 grid, with options to pass, abort and even cheat (if you can find it . . .)

5.25 inch disc (40/80 track format): £7.95

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- allows screen dumps without affecting current program
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- comprehensive user guide

Requires: BBC/B with O.S. 120 disc drive and 16k sideways Ram

Supplied on disc in 40/80 track compatible format

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Price: £18 (inc vat, p&p)

EPROM EQUIPMENT

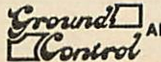
MULTIPROM is an EPROM programmer for the BBC MICRO (with DFS) for 2764, 27128, 27256, 27512, 27513, and 27011 Eproms, including aversions. It is fully cased with a textool ZIF socket and plugs into the user port.
Detailed data is available on request.

Multiprom	£44.95
Software including fast Algorithim:- UVP 1.1 Rom	£8.00

The compact (90 × 80 × 40mm) UVIPAC EPROM erasers can handle up to 3 EPROMs at a time.
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EPROMS	1-2	3-9	10 up
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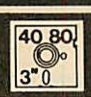


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1) Random Access	- disc based, single or dual drives
2) File Size	- max 65,000 records
3) Record Size	- up to 2048 characters and 200 fields
4) Field Size	- up to 254 characters
5) Holds	- approx 1200 ADDRESS records per 100k
6) Search	- 5 search fields using powerful options
7) Sort	- 500 records on 3 fields in 60 seconds.

SYSTEM FEATURES

*CALCULATE - using any valid expression
*PRINTOUT - Powerful options
*REDEFINE - Titles, fields etc.
*TRANSFER - From one file to another
*GLOBAL ENTRY - of repetitive data
*SEARCH LISTS - Allow creation of sub Databases within main Database
*SPOOLER - enables you to create spooled files that are compatible with Wordwise, View etc.
*INPUT - is a routine included on the disc which will allow you to write your own utilities for accessing your data. Many of the programs on the utilities disc were written using this procedure

BETA-BASE UTILITIES £12.00

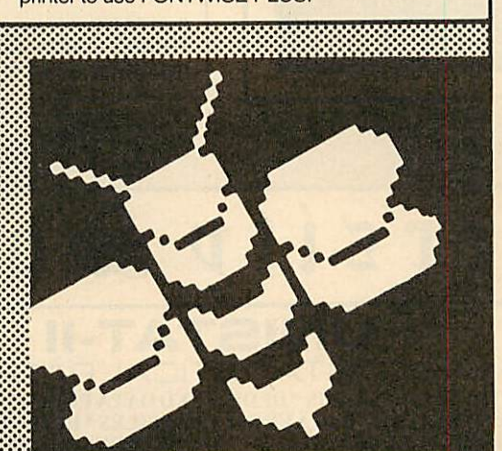


Extend the power of Beta-Base with the extra facilities provided on this disc.

*MAIL MERGE
*LABEL PRINTER
*DISC SORT
*EXTENDED SEARCH
*FREE FORMAT TRANSFER
*FAST PACK
*STATUS

The MAIL MERGE alone is worth £12 so you get a real bargain with this disc. The features are so numerous that we cannot mention them all here.

Ask for our UTILITIES DATA SHEET if you want more information.



MACROM £40 £35 DISC



MACROM is a fast full featured MACRO ASSEMBLER ROM that allows the use of macros, which are loaded from a macro library stored on disc. Assembly can be from disc to memory, disc to disc, memory to memory or memory to disc, thus allowing the use of very long source code up to the length of your disc. MACROM source code is tokenized and thus takes up far less room in memory or on disc than most assemblers.

- Operate in any mode
- Tokenized source code
- Assembles 6502 & 65C02 codes
- Automatically loads macros from library on disc
- Automatically loads subroutines from disc
- Macro library supplied plus demo files
- Chain program sections into main code
- Many different assembly options
- Converts BBC assembler code into MACROM source code
- Very fast & very flexible

In a comparison with ADE, MACROM was able to assemble a program to disc in 1 min 24 secs compared to 5 minutes with ADE and the source code took up 30% less room on the disc.

Ask for a data sheet today

RAMROD £40 ROM £35 DISC

RAMROD is the ultimate in toolkit ROMs and is fully compatible with the whole BBC range from Model B through to the MASTER 128 and including both 6502 and TURBO co-processors. RAMROD adds 54 new commands to your computer. Areas covered are DISC (DFS & ADFS), GENERAL (memory commands etc.), ROM (including sideways RAM) and TUBE.

RAMROD provides commands to dump memory or a disassembly of memory to a printer. Editors can display the screen in 40 or 80 column mode.

DISC
Edit discs and search for ASCII or HEX sequences.

GENERAL
Edit, search, disassemble, compare, dump to printer and relocate ANY area of memory including the SHADOW screen. List vectors in use, load and save function keys even on MASTER etc.

In addition to the above you can move between ROM/RAM banks using (CTRL) Cursor Keys when in either memory or disassembly mode PLUS you can switch between memory editor and disassembler by pressing (CTRL)(TAB).

ROM
Includes commands for listing, loading, saving, wiping, swapping, ROM images. PLUS formatting and titling RAM banks for the ROM filing system and saving programs in RFS format.

TUBE
Provides the same memory commands as GENERAL plus SHIFT and COMPARE memory across the TUBE both ways.

We cannot do justice to RAMROD in the space here so please ask us to send you a fuller data sheet - RING NOW!

NEW PRODUCTS
Watch out for a fabulous new product which will be released during SEPTEMBER for the MASTER and its compatibles.

This is a high quality art package called ARTROOM but it offers many features not provided elsewhere. It is a full screen package and is written by the authors of FLEET STREET EDITOR so you know that it will be good.

Ask for a data sheet NOW!

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80	80 TRACK
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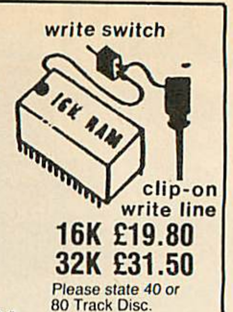
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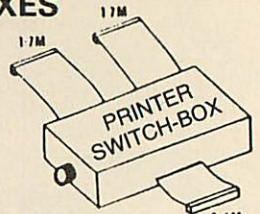


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MULTIVARIATE REGRESSION: Simple corr matrix, choice of dep var, selection of indep vars, noconstant reg. Selection-specific missing data handling. No. of rows and cols omitted due to missing values and multicollinearity. Output includes estimated coeffs, t-stats, std errors, R2, adjusted R2, std error of reg, F-stat, D-W stat, ANOVA of reg, var-covar and multiple corr matrices, interpolation, plot of residuals, plot of actual and fitted y values. Addition of residuals and/or fitted y values to data matrix.

STATISTICAL TESTS: Significance levels for most test stats. Test-specific missing value handling. PARAMETRIC: One sample t, two sample t with equal and unequal vars, paired t, F. NON PARAMETRIC: Chi-sqr and Kolmogorov-Smirnov, (both with equal and unequal exp freq versions), chi-sqr Bartlett, Mann-Whitney U for small, medium and large samples, Wilcoxon signed rank, Walsh, Wald-Wolfwitz runs. Kruskal-Wallis one-way ANOVA, Friedman pseudo two-way ANOVA, Jonckheere trend, Page's L, Cochran Q, Goodman-Kruskal gamma, Sommer's d. CORRELATION COEFFICIENTS: Pearson, Spearman's rho, Kendall's tau, Point biserial, Goodman-Kruskal gamma, Sommer's d, Yule's Q, phi, tetrachoric. DISTRIBUTIONS: Chi-sqr, t, F, Normal (std, non std), log, inverse and bivariate normal, binomial, negative binomial, exponential, hypergeometric, gamma function, Khrgian-Mazin.

DESCRIPTIVE STATISTICS: Analysis of raw data or data with freq counts. Raw data sorted and grouped. Freq dist with choice of lower bounds and class intervals. Absolute, cumulative and relative freq. Histograms, scatter diagrams and time series plots. Output includes sum, mean, mean deviation, median, variance, std deviation, third and fourth moments, skewness, kurtosis, range, etc.

ANALYSIS OF VARIANCE: One-way with and without repeated measures, two-way with no interaction, two-way and three-way with one, two and without repeated measures.

TABULATIONS: CROSS-TABLUATION: Two-way tables with col and row totals and percentages. CHI-SQUARE CONTINGENCY TABLE: Observed freq, exp freq and chi-sqr for each cell. Col and row sums, overall chi-square stat and its significance level. Yates correction.

HIGH RES PLOTS: All plots can be dumped on the printer. PLOT OF BIVARIATE REGRESSION: Scatter diagrams with optional line of best fit, intercept, slope, R2, std error. CURVE FITTING: Fitting of polynomials on bivariate data. Fitted polynomial coeff, R2 and std error. TIME SERIES PLOTS: Simultaneous plotting of up to 7 columns of data against time. PLOT OF FUNCTIONS: Simultaneous plotting of up to two functions, integrals, polynomials and roots of polynomials.

DEFAULT SETTINGS (For BBC version): Choice of screen and device control parameters. 40 or 80 column display, number of data drive 0/1/2/3, black & white or colour monitor width of printer, high-res screen dump command, maximum formula length, maximum number of columns and rows depending on free RAM.

LINTPRO Linear/Integer Programming Package.

Written by Dr D. Sprevak

A professional package which can solve very large problems on a 32K BBC micro by means of revised simplex algorithm and efficient vectorisation. It can solve a problem with 82 variables, 60 constraints and 15 upper bounds in 24 minutes. Runs faster on second processor, Plus or Master series. LINTPRO requires minimal prior knowledge of linear programming techniques and is ideal for real applications as well as for teaching purposes. Data entry in Backus-Naur notation. Selection of optimality of solutions between 0% and 100%. Optional printing of intermediary steps and choice of branching strategies. Output includes optimal values of variables, value of objective function, slackness, shadow prices and it can be directed to screen or to a text file.

CPA Critical Path Analysis

Written by Dr J. S. Dean

A comprehensive coverage of critical path analysis sufficient for most practical applications. Activities and durations are supplied as input and earliest and latest start and finish times for each activity, total float and critical path are obtained as output. Easy editing of inputs provides the possibility of analysing the sensitivity of solutions. A built-in calendar can give dates to any programme. Resources can be allocated to each activity. Suitable smoothing scheme is chosen and a resource bar chart is drawn. Results can be directed to printer or to text files. High-res plot of the node structure can be dumped on printer.

UNISTAT-II, LINTPRO AND CPA ARE AVAILABLE FOR: BBC B, PLUS AND MASTER SERIES, AMSTRAD PCW8256, PCW8512, IBM PC/XT/AT AND COMPATIBLES BBC versions: UNISTAT-II: £125+VAT, LINTPRO: £75+VAT, CPA: £50+VAT. AMSTRAD and IBM versions: UNISTAT-II: £150+VAT, LINTPRO: £100+VAT, CPA: £75+VAT.

Prices include post & packing within the UK. Official (government, university, local authority) orders are welcome. For orders from Europe add £5, from outside Europe £10. For BBC versions please indicate 40 or 80 track format. Cheques and correspondence to: **UNISOFT LTD, P.O. Box 383, Highgate, London N6 5UP.**

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- Uses less power than other 256K boards.
- All prices fully inclusive of VAT, post and packing.

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ESP003:	£10.00	Factory upgrade your 256K Rom Board to 64K/192K Ram/Rom Board. Return your board to us and we will upgrade it for you.
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Please note that Ram chips, and switches for write-protect/read-inhibit, are not included in the basic boards or upgrades. It is possible to upgrade the Rom Board to accept Ram yourself: full instructions are included with the board; soldering is required. Specifications of all products given in good faith but are subject to change without notice. Availability of some items may vary. Please telephone for latest delivery situation.

Cheques should be made payable to: *Edinburgh Software Products.*

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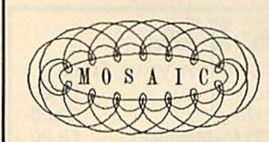
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Both packages have explicit input prompts and error messages. This together with over 80 pages of online **HELP** data makes these systems easy to use and easy to learn – an ideal way of introducing this new technology.

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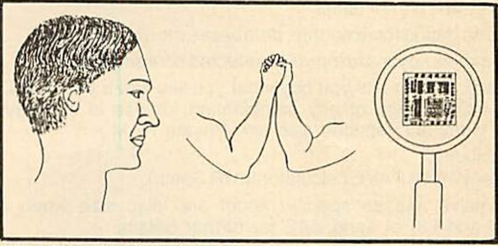
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ACORN USER ADVERTISEMENT PAGES – MARCH 1987

FREE ADS

Serious BBC penpal wanted to exchange information. Must have a disc drive. Dov Rosner, Beery 25, Netanid. 42258, Israel.

Do you own a BBC/Electron, Atari, Amstrad or Commodore micro? If you do and live in the Southampton area, then you may wish to join a new user group. This is a new group so, go on give it a chance. For info write to Iain Campbell, 14 Hobart Drive, Hythe, Southampton, Hants S04 6FH.

Wanted Acorn Teletext adaptor. Tel: Brian on Blandford (0258) 53742.

Unused 100 96 TPI double sided double density discs for sale. Sale due to change of drives. Will separate, offers welcome. Tel: Leeds (0532) 758612 after 8pm, weekends or evenings.

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BBC B computer 1.2 OS 1770 DFS, new disc drive, 20 discs, £295; Nightingale Modem Commstar £85 RTTY interface chip £25. Tel: (0872) 76807.

Atom 24k with ROM Box, Sound Board, uncomplete disc pack, F.P. ROMS and EPROMS simulator. £150 ono. Also information, Tel: 01-940 5635.

Watford 32k RAM card, complete £35. Sideways Zif socket, £10. *View 2.1* ROM, £20. Tel: Hull (0482) 847256.

Torch Z80/BBC System. Dual drives RGB monitor, printer, graphics ROM, EPROM programmer, £675 ono (will split). Tel: Harlow (0279) 415335.

For sale, Tandy GGP-220 colour jet ink printer £300 ono. Tel: (02214) 5561, day or (0793) 783714 evenings.

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Electron Plus 1, Cumana disc interface, T2CV, data recorder, twin joysticks, discs, sixty games, magazines, books, tapes, *View, Viewsheet*, £120 ono. Tel: (0305) 775644.

BBC B, Acorn DFS, Solidisk 64k SWR Pace 40/80 double sided drive (PSU), *Music 500*, ROMs, joystick, manuals, £500. Will split. Price negotiable. Tel: (0204) 491851.

Epson RX80 printer with BBC printer cable in excellent condition with original box, £140. Tel: Nottingham (0602) 733676.

BBC B OS1.2 Acorn DFS, ATPL ROM-board, Basic extensions, *Wordwise, View*, disc s/w – Clares *Beta-Base, Elite, Aviator*. £250. Tel: (Weybridge) 57476.

Taxan Kaga KP810 printer, 1k buffer, cable £170, zenith green monitor £50, *Wordwise* +, £25, £220 the lot. Tel: Lymm (092575) 3336.

BBC B, DNFS, OS1.2, ser.7, 40/80t drive, modem, green monitor, cassette recorder *Commsoft, Discdoc* ROMs, various software, manuals, vgc, £500. Tel: 021-503 0212.

BBC model B 1.2OS, cassette, joysticks monitor stand, printer and RGB leads, £100 worth software, £40 books, good condition, £250 ono the lot. Bournemouth area. Tel: Highcliffe (04252) 71972.

Wanted Microwriter MK1V or Quinkey system. Reasonable price paid. Write to: C P Jamieson, 50HK WKSP, BFP01.

BBC B, Acorn DFS, 1770 ADFS, Canon 80/40, Microvitec 1431 monitor, £400 ono. Also ATPL board, ISO-Pascal *Commstar*, offer? O'Donovan, 01-693 8975.

BBC B computer issue 7, boxed, immaculate condition Acorn data recorder, six games, £200 ono. Tel: (0895) 445023.

Printer Seikosha GP100, complete with leads, manuals etc, immaculate condition, still in original box, £65. Tel: Sidmouth (03955) 2660.

Epson RX80 tractor feed perfect condition with manual £100. Phone 01-692 1034, evenings.

First Byte switched joystick interface and Quickshot 2 joystick for Electron for sale, £18. Ring Rickmansworth (0923) 776173, evenings.

Electron with Plus-1, ACP+4 ACP+5, AMX *Art*, All boxed, a bargain at £300. Tel: (0787) 61311, evenings only please.

Urgent! student requires a BBC B, disc drive, with monitor (or TV link), *View* useful. Funds limited to approx. £300. Tel: 01-879 1680.

Alphacom model 42 printer with interface for BBC, as new condition, £40. Tel: Shrewsbury 63331.

Wanted plus 1 and plus 3, must be in good working order. Tel: (0522) 690977.

Quick sale, BBC B, twin drives, printer, 32k SWR datacorder, 40 ROMs; software and magazines to sink battleship, only £420. Tel: 01-337 8080.

Seikosha GP100 printer, cable, dust corner, paper, ribbon, screen dumps, boxed, excellent condition, £60 ono. Tel: Durrington Walls (0980) 53619.

Wanted BBC B, any condition, peripherals considered. Must be reasonable offer. Tel: (0248) 364260.

BBC B computer 1.2OS £225, Microvitec monitor £150. Tel: (0527) 404211.

Printer Walters WM2000 tractor feed 9 pin head fast 107 CPS no cable no manual. Print sample available £80 including postage. Tel: (0262) 601613.

RGB monitor, high resolution, uncased £75. Printer fully Epson-compatible (Panasonic) £100. Tel: (0689) 49249 evenings or weekends.

BBC B, Torch Z80, Acorn DFS, Pace disc drives, NLQ printer green screen monitor, joysticks, software, £895 ono. For details ring Tom, Wolverhampton (0902) 332929.

Watford ROM/RAM card 32k dynamic RAM with manual, utilities disc, 16k static RAM, read/write protect switches, £40 ono. Tel: Sue, (06077) 4835 after 6pm.

Acornsoft ISO Pascal ROMs, £30 and Basic 2 ROM, £10 Tel: 01-743 3173.

ATPL 'Symphony' music keyboard for use with BBC micro, £60. Mr C A Hynam, 23 Baugh Gardens, Downend, Bristol. Tel: (0272) 561237.

Wanted for BBC B: Lisp and Micro-Prolog ROMs and manuals. Tel: Ipswich (0473) 689084.

Repton 3. Want to complete game? Phone (0737) 833106 and ask for Arash, (evenings). Will give details on how to acquire passwords.

Acorn Z80 second processor, complete with all software + manuals, boxed as new, £225. Will deliver. Tel: (0955) 82623.

Electron peripherals, AP4 disc interface £60, E2P second processor £60, advanced user guide, many games on cassette. Tel: Rayleigh 777324 (evenings).

New Master turbo twin 80/40 drive, three ref. manuals, three cartridges, R/W RAM cartridge, only £750. Tel: (0705) 256699, (Hampshire).

Wanted info on how to convert a Commodore joystick to a BBC (Quickshot II). Please contact Ian on (Bradford) 579150, please!

Solidisk 1770 disc interface with DFS/ADFS 2.1 brand new £35. Tel: (0908) 648610, evenings or weekends.

Wanted plus-1 and plus-3 for Electron also software. Please write Mr Gilroy, 36 Golfview Cres, Elgin, Morayshire, IV30 3JP.

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Acorn 6502 second processor with DNFS and Hibasic ROMs, manual and original packing, £100. Excellent condition. Tel: Southampton (0703) 695450

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Quinkey keyboard, software, interface and manual £40. Replay (R1770A) ROM, manual and instructions, £24. Tel: Taunton (0823) 443270.

Watford 32k shadow RAM card and manual required, Phil Dyer, Gweal Mellin, Constantine, Falmouth, Cornwall, TR11 5RW. Tel: (0326) 40440.

Torch graduate 640k, RS232, parallel, clock, exchange software Descview, BBC Basic worth £1000, £400 for quick sale. Tony: (0925) 811548, Warrington.

Opus 5802 40/80 track drive, solidisk interface, offers to Moulder, 10 Parsonge Road, Rainham, Essec. Tel: 22994.

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Modem, Prism 1000, complete with Micronet ROM, £35. Tel: (0202) 420702.

Repton 3 competition answers £2, Mike Norton, 30 The Gardens, Radford Semele, Leamington Spa, Warwickshire.

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First Byte joystick interface and Quickshot II joystick, still under guarantee, £20. No offers. Tel: Ian on (0244) 532494, after 5pm.

6502 2nd processor, *Hi-View*, Hi-Pascal and 6502 *Elite* only £95. AMX Mouse and all software, only £40. EPROM programmer & eraser and ROMS only £50, Tel: (05827) 69152.

Micro-P CPA-80 printer for sale. Serial impact DOT Matrix. ASCII and JIS characters. Cost £250, superb condition. Tel: 01-642 0480.

BBC B, 1.2 DFS, double sided 40/80 track disc drive. ATPL ROM board and sideways RAM £700 software including ROMS £650 ono. Tel: 01-444 7748.

Acorn 6502 second processor as new complete with ROMs and manual £99. Gibbons: Wantage (02357) 3253.

Sale, complete set of *Acorn Users*, £25, *Penfriend* with Z80 2nd processor wanted. Northampton 401419 Tuesdays and Wednesdays, after 6.30pm.

Electron User magazines wanted: Oct 83, Nov 83, Dec 83, Jan 84, Feb 84, Sept 84, Oct 84. Write or phone: Coventry 686136. Your price paid + postage.

Wanted Computer Concepts speech and text-to-speech ROMs. Will buy or swap. Phone: Cardiff (0222) 811076.

Wanted Electron disc interface, will pay £25-£35 depending on make. Peter Baillie, 15 James Wait Avenue, Bo'ness, West Lothian, Scotland.

Printer. Walters micro systems, Dolphin BD 80P. Dot matrix BS232 interface. Offers. Phone: (0844) 52190.

For Sale: £223, tape originals, data recorder, tape deck, LVL echo, keyboard, Quickshot joystick, books & magazines, £200 the lot. Tel: 061-707 1857 after six o'clock.

BBC B disc users wanted as penpal to swap ideas, info, tips. Serious users only. Alan Brickman c/o 5 UDR, BFPO 802.

BBC B, manual, cassette, leads software, 05.1.2. Excellent condition, issue six, £190 cash (only). Tel: (0273) 502199.

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ACORN USER'S

DIARY

A1 weather report latest

The filthy weather has kept the motorway-eating Acorn reps off the road. Nasty snow drifts have led to Turbo Reliant Robins with micro-filled boots being abandoned.

News on the A1 has been good, except for one rep who was caught in a blizzard. Fast-thinking saved his bacon as he hopped in a cab leaving his broken down car near the junction of the A1 and 599.

Rates aren't cheap though, and rest of his journey to Aberdeen cost him a fortune.

And the weather men reckon things could get worse, with the selling getting even riskier. Cold conditions are expected until May.

Tefal pursuits exclusive



BBC Software manager Dave Atherton (left), long famous as the man who keeps BT afloat, has leapt to a new fame in Domark's Trivial Pursuit Golden Challenge.

He came second, narrowly avoiding being presented with a gold-plated version of the game, to John Cook a Portsmouth Polytechnic lecturer.

Although never lost for words, Mr Atherton, known to readers for his articles and through his regular attendance at Acorn shows, was uncharacteristically reticent to talk about his success. Our reporter Orson Fact was able to get away from the BBC after just five hours during a flood alert. (Everyone was evacuated to laugh at someone crawling behind a coffee machine in a pool of tea.)

But the BBC could soon be losing its biggest brain. The non-stick Mr Atherton, now known as 'Tefal', is set to pursue a freelance career. Asked how he felt after, Tefal replied: 'Sick as a parrot.' He added that he might come back to the BBC as a contestant on Mastermind. Wonder what his special subject would be?

The board of the BBC has had several meetings to come up with a replacement, but has yet to make a decision. Those short-listed include Clarence the cross-eyed lion, Mark Webb, Bonzo, Sid Smith, Guy Kewney and an Amstrad PC.

Flood warning at the BBC

A full-scale flood alert was launched and a mayday message sent out from the BBC early last month.

Half the new Woodlands concentration camp building was evacuated after Jim Day – the BBC engineer who looks after the BBC micro project – went to the coffee machine.

Jim, who's due to move to a corner of a Woodlands office, put in his money and out came a cup of tea. And another . . . and another . . . and another! Twenty cups later Day's lightning brain found the solution – turn it off! The 'Kenco Kid's' only comment after was, 'I never did get my 4p change.'

Doppelganger department



Doppelgangers abound at *Acorn User*, at least as far as names are concerned. Another Bruce Smith has appeared (although the original is set to disappear), two John Kings and more Davids than you know what to do with. Thank goodness there's only one Quinn (and that's one too many).

Take over bid

Acorn has got a bit above itself. A press release reads, 'the board announced the appointments of Paolo Tosi, managing director of British Olivetti Ltd, and Franco Agostinucci, vice president for product and market strategy at Olivetti.'

Since when has Acorn announced appointments to Olivetti's board?

Secret Olivetti guidelines for running Acorn

Our moles have discovered the existence of a top secret document circulating Acorn. Further undercover operations revealed its contents, which appear to be Olivetti's guidelines for running Acorn. The document reads:

1 First make sure that your acorn is healthy and not wrinkled or hard.

2 Fill the vase with water. Top up from time to time.

3 Acorns prefer a temperate climate, but a slightly warmer atmosphere than usual will also speed germination.

4 If after this time no germination has occured, you probably have a dud acorn.

Olivetti has found its acorn, poured in the cash and topped it up. It also made things very hot for a lot of people. Olivetti is believed to be at stage four.

Further enquiries have revealed that the document is from Wedgewood (though we haven't told Olivetti yet). It's really the instructions from the Acorn Vase (yes, it really does exist. Just supply your own acorn and water).

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These Acornsoft Hits compilation packages are the results of the recently announced venture between Superior Software and Acornsoft. The games have been carefully chosen to offer a balanced selection of the very best of Acornsoft's classic titles . . . at a price that is simply stunning value-for-money.

Acornsoft Hits Volume 1

Magic Mushrooms "What's magic about Magic Mushrooms? A lot. It's great stuff; go and buy it — you won't be disappointed." . . . Acorn User.

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Rocket Raid A suberb sideways-scrolling arcade style game. You must fly your spaceship through the planetary caverns wherein are deadly aliens, guided missiles meteor storms and many other hazards.

Acornsoft Hits Volume 2

Starship Command Command a starship against the attacking aliens in this demanding high-resolution graphics game. Your ship is equipped with shields, long and short-range scanners and a sector display of the stars and alien ships.

Arcadians Watch out for the deadly dive-bombing tactics of the Arcadians as they fly in convoy overhead. 1-player and 2-player options, intriguing music and a demonstration mode are some of the features of this excellent game.

Meteors Steer your laser-ship through a hail of meteors, smashing them with your laser bolts as they hurtle towards you on all sides. Avoid being hit by missiles from the flying saucers. The hyperspace escape facility is available as a last resort.

Labyrinth Guide Mork through the labyrinth, eating fruit to replenish his dwindling energy supply. Crush the Tiger Moths, shoot the Flitterbugs and dodge the Threshers as you venture towards the magic crystals.

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Acorn Electron Versions

Rocket Raid and Labyrinth are not available for the Acorn Electron.
The Acornsoft Hits Volume 1 features:
Magic Mushrooms, Planetoid, Maze, Monsters.
The Acornsoft Hits Volume 2 features:
Starship Command, Arcadians, Meteors, Snooker.

Acornsoft Hits Volume 2

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